DEVELOPING A STATE WATER PLAN

GROUND-WATER CONDITIONS IN UTAH, SPRING OF 1981

by

L. R. Herbert and others

United States Geological Survey

Prepared by the United States Geological Survey
in cooperation with the State of Utah

Published by
Division of Water Resources
Utah Department of Natural
Resources and Energy

Cooperative Investigations Report Number 21

1981

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Most values are given in this report in inch-pound units followed by metric units in parentheses. The conversion factors used are shown to four significant figures. However, in the text the metric equivalents are shown only to the number of significant figures consistent with the accuracy of the value in inch-pound units.

Inch-pound Unit (Multiply)	Inch-pound Abbreviation	(by)	Metric Unit (to obtain)	Metric Abbreviation
Acre-foot	acre-ft	0.001233	Cubic hectometer	hm^3
Foot	ft	0.3048	Meter	m
Inch	in.	25.40	Millimeter	mm
Mile	mi	1.609	Kilometer	km

Chemical concentration is given only in metric units—milligrams per liter (mg/L). For concentrations less than 7,000 mg/L, the numerical value is about the same as for concentrations in the inch-pound unit, parts per million.

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INTRODUCTION

This is the eighteenth in a series of annual reports that describe ground-water conditions in Utah. Reports in the series, prepared cooperatively by the U.S. Geological Survey and the Utah Division of Water Resources, provide data to enable interested parties to keep abreast of changing ground-water conditions.

This report, like the others in the series, contains information on well construction, ground-water withdrawals, water-level changes, and related changes in precipitation and streamflow. Supplementary data such as graphs showing chemical quality of water and maps showing water-table configuration are included in reports of this series only for those years or areas for which applicable data are available and are important to a discussion of changing ground-water conditions.

The report includes individual discussions of selected major areas of ground-water withdrawal in the State for the calendar year 1980. Water-level fluctuations, however, are described for the period spring 1980 to spring 1981. Much of the data used in the report were collected by the Geological Survey in cooperation with the Division of Water Rights, Utah Department of Natural Resources.

The following reports dealing with ground water in the State were released by the Geological Survey during 1980:

Analytical results for 50 water samples from Beaver Valley, Utah, by J. B. McHugh, W. H. Ficklin, and W. R. Miller, U.S. Geological Survey Open-File Report 80-517.

Digital-computer model of ground-water flow in Tooele Valley, Utah, by A. C. Razem and S. D. Bartholoma, U.S. Geological Survey Open-File Report 80-446.

Ground-water conditions in Tooele Valley, Utah, 1976-78, by A. C. Razem and J. I. Steiger, Utah Department of Natural Resources Technical Publication 69.

Ground-water conditions in the upper Virgin River and Kanab Creek basins area, Utah, with emphasis on the Navajo Sandstone, by R. M. Cordova, U.S. Geological Survey Open-File Report 80-524 (pending publication as Utah Department of Natural Resources Technical Publication 70).

Hydrologic and climatological data, southeastern Uinta Basin, Utah and Colorado, water year 1978, by L. S. Conroy, U.S. Geological Survey Open-File Report 80-1025 (also duplicated as Utah Hydrologic-Data Report 34).

Hydrologic reconnaissance of the southern Great Salt Lake Desert and summary of the hydrology of west-central Utah, by J. S. Gates and S. A. Kruer, U.S. Geological Survey Open-File Report 80-445 (pending publication as Utah Department of Natural Resources Technical Publication 71).

Results of hydraulic tests in wells DOE-1, -2, and -3, Salt Valley, Grand County, Utah, by F. E. Rush, I. M. Hart, M. S. Whitfield, T. F. Giles, and T. E. D'Epagnier, U.S. Geological Survey Open-File Report 80-205.

Results of test drilling for ground water in the southeastern Uinta Basin, Utah and Colorado, by W. F. Holmes, U.S. Geological Survey Water-Resources Investigations 80-951.

Springs and depth-to-water in shallow aquifers, Fort Douglas, Salt Lake City North, and Salt Lake City South Quadrangles, Salt Lake and Davis Counties, Utah, by Richard Van Horn, U.S. Geological Survey Open-File Report 80-819.

The Navajo Sandstone: A regional aquifer, by J. W. Hood, in Utah Geological Association 1980 Henry Mountains Symposium, pages 268-276.

Three-dimensional digital-computer model of the Ferron sandstone aquifer near Emery, Utah, by D. J. Morrissey, G. C. Lines, and S. D. Bartholoma, U.S. Geological Survey Water-Resources Investigations 80-62.

UTAH'S GROUND-WATER RESERVOIRS

Small quantities of ground water can be obtained from wells throughout much of Utah, but large supplies that are of suitable chemical quality for irrigation, public supply, or industrial use generally can be obtained only in specific areas. The major areas of ground-water development discussed in this report are shown in figure 1 and named in table 1. Only a few wells outside of these areas yield large supplies of water of good chemical quality for the uses listed above, although some of the basins in western Utah and many areas in eastern Utah have not been explored sufficiently to determine their potential for ground-water development.

About 2 percent of the wells in Utah obtain water from consolidated rocks. The consolidated rocks that yield the most water are lava flows, such as basalt, which contain interconnected vesicular openings or fractures; limestone, which contains fractures or other openings enlarged by solution; and sandstone, which contains open fractures. Most of the wells that tap consolidated rocks are in the eastern and southern parts of the State in areas where water supplies cannot be obtained readily from unconsolidated rocks.

About 98 percent of the wells in Utah draw water from unconsolidated rocks. These rocks may consist of boulders, gravel, sand, silt, or clay, or a mixture of some or all of these materials. Wells obtain the largest yields from the coarser materials that are sorted into deposits of uniform grain size. Most wells that tap unconsolidated rocks are in large intermountain basins, which have been partly filled with rock material eroded from the adjacent mountains.

SUMMARY OF CONDITIONS

The estimated total withdrawal of water from wells in Utah in 1980 was about 762,000 acre-feet (940 hm^3)—about 98,000 acre-feet (121 hm^3) less than in 1979 and 44,000 acre-feet (54 hm^3) less than the average annual withdrawal during 1970-79 (table 2). The decrease in withdrawal was due primarily to decreases in withdrawal for irrigation. Total withdrawal for irrigation in 1980 was about 494,000 acre-feet (609 hm^3) (table 2), which is 73,000 acre-feet (90 hm^3) less than reported for 1979. Withdrawal for public supply was 143,000 acre-feet (176 hm^3), a decrease of 19,000 acre-feet (23 hm^3).

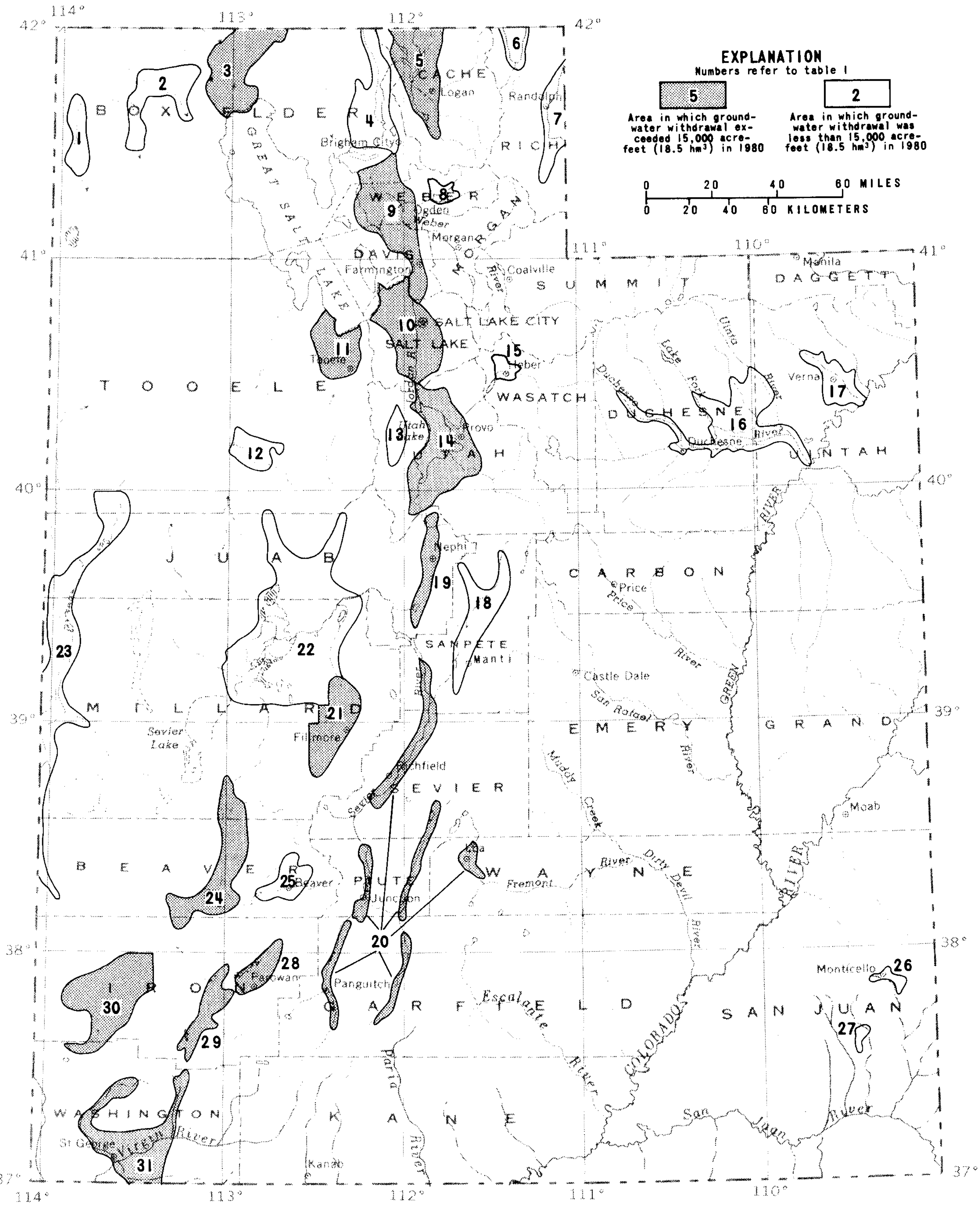


Figure 1.—Areas of ground-water development specifically referred to in this report.

Table 1.—Areas of ground-water development

Number in figure 1	Area	Principal type of water-bearing rocks
1	Grouse Creek valley	Unconsolidated
2	Park Valley	Do.
3	Curlew Valley	Unconsolidated and consolidated
4	Malad-lower Bear River valley	Unconsolidated
5	Cache Valley	Do.
6	Bear Lake valley	Do.
7	Upper Bear River valley	Do.
8	Ogden Valley	Do.
9	East Shore area	Do.
10	Jordan Valley	Do.
11	Tooele Valley	Do.
12	Dugway area	Do.
13	Cedar Valley	Do.
14	Utah and Goshen Valleys	Do.
15	Heber Valley	Do.
16	Duchesne River area	Unconsolidated and consolidated
17	Vernal area	Do.
18	Sanpete Valley	Unconsolidated
19	Juab Valley	Do.
20	Central Sevier Valley	Do.
	Upper Sevier Valleys	Do.
	Upper Fremont River valley	Unconsolidated and consolidated
21	Pavant Valley	Unconsolidated
22	Sevier Desert	Do.
23	Snake Valley	Do.
24	Milford area	Do.
25	Beaver Valley	Do.
26	Monticello area	Do.
27	Blanding area	Do.
28	Parowan Valley	Unconsolidated and consolidated
29	Cedar City Valley	Unconsolidated
30	Beryl-Enterprise area	Do.
31	Central Virgin River area	Unconsolidated and consolidated

Table 2.—Well construction and withdrawal of water from wells in Utah

Area	Number in figure 1	Number of wells completed in 1980[1]: Total	6 inches or more[2]	Estimated withdrawal from wells (acre-feet): 1980: Irrigation	Industry	Public supply	Domestic and stock	Total (rounded)	1979 total[3]	1970-79 average annual[4]
Cache Valley	5	50	1	12,300	7,100[5]	3,700	2,100	25,000	28,000	26,000
East Shore area	9	64	4	15,800[6]	8,000	27,100	—	51,000	51,000	44,000
Jordan Valley	10	58	13	3,400	31,000[7]	61,100	32,000[5]	128,000	136,000	124,000
Tooele Valley	11	28	7	22,200[6]	500	4,300	150	27,000	30,000	29,000
Utah and Goshen Valleys	14	99	7	55,000	10,800	18,200	12,700[8]	97,000	108,000	99,000
Juab Valley	19	5	0	14,300	50	450	200	15,000	21,000	24,000
Sevier Desert	22	41	2	11,300	1,200	800	1,100	14,000	45,000	31,000
Sanpete Valley	18	30	1	7,800	500	800	3,500[8]	13,000	19,000	20,000
Upper and central Sevier Valleys and upper Fremont River valley[9]	20	49	2	15,000	100	3,400	5,700	24,000	24,000	22,000
Pavant Valley	21	4	1	74,200	100	150	300	75,000	86,000	90,000
Cedar City Valley	29	17	7	24,100[10]	900	3,000	400	28,000	32,000	34,000
Parowan Valley	28	1	0	27,600[10,11]	350	300	150	28,000	30,000	29,000
Escalante Valley										
Milford area	24	0	0	60,000[12]	0	1,000	300	61,000	49,000	60,000
Beryl-Enterprise area	30	16	7	69,600[10]	0	370	750	71,000	79,000	78,000
Other areas[13]		478	46	81,100	4,200	18,200	1,600	105,000	122,000	96,000
Totals (rounded)		940	98	494,000	65,000	143,000	61,000	762,000	860,000	806,000

[1] Compiled from data supplied by Utah Department of Natural Resources, Division of Water Rights. Includes deepened and replacement wells.
[2] Constructed for irrigation, industry, or public supply.
[3] From Herbert and others (1980, p. 5).
[4] Calculated from previous reports of this series. Some figures include unpublished revisions.
[5] Includes some use for fish and fur culture.
[6] Includes some domestic and stock use.
[7] Includes some use for air conditioning.
[8] Includes some use for irrigation.
[9] Upper Fremont River valley included in "Other areas" prior to 1976.
[10] Data from reports of local water commissioners to the Utah Department of Natural Resources, Division of Water Rights.
[11] Includes some use for stock.
[12] Data from the Milford Water Commissioner.
[13] Withdrawals are estimated minimum amounts.

Table 3.—Total annual withdrawal of water from wells in major areas of ground-water development in Utah, 1970-79
(From previous reports in this series)

Area	Number in figure 1	Thousands of acre-feet									
		1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Cache Valley	5	25	24	23	24	24	25	27	32	26	28
East Shore area	9	39	41	41	42	50	41	41	52	40	51
Jordan Valley	10	109	116	124	129	130	122	124	119	127	136
Tooele Valley	11	25	24	29	29	33	29	30	28	30	30
Utah and Goshen Valleys	14	83	86	91	89	106	98	107	118	106	108
Juab Valley	19	18	21	30	17	31	25	29	29	19	21
Sevier Desert	22	16	17	40	22	25	26	33	50	39	45
Sanpete Valley	18	14	16	20	16	17	15	25	36	26	19
Upper and central Sevier Valleys and upper Fremont River valley	20	19	19	19	19	20	24	25	26	26	24
Pavant Valley	21	71	79	99	69	101	98	95	117	88	86
Cedar City Valley	29	31	36	35	27	42	28	37	40	31	32
Parowan Valley	28	26	24	28	26	31	28	34	33	29	30
Escalante Valley											
Milford area	24	56	58	59	52	70	60	65	65	58	49
Beryl-Enterprise area	30	70	75	77	74	93	85	79	81	71	79
Other areas		72	75	80	79	106	85	108	121	113	122
Totals (rounded)		670	710	800	710	880	790	860	947	829	860

The quantities of water withdrawn from wells are closely related to local climatic conditions. Precipitation in 1980 was above average in most of Utah (National Oceanic and Atmospheric Administration, 1981). Of the 33 stations for which graphs of cumulative departure from average annual precipitation are included in this report, 1 had below-average precipitation in 1980. This contributed most significantly to decreased withdrawals from wells during 1980.

The above-average precipitation in most parts of the State during 1980 resulted in increased water supplies, recharge of ground water, and water for reservoirs as well as decreased withdrawals from wells. This in turn resulted in a general rise of ground-water levels in many parts of the State from spring of 1980 to spring of 1981. Notable exceptions where declines occurred were in areas where local above-average runoff contributed greatly to the recharge of the ground-water reservoir in the spring of 1980 but was not a factor in the spring of 1981. Also, declines occurred in some areas of late-season withdrawals.

The total number of wells drilled during 1980 (table 2), as indicated by well-drillers' reports filed with the Utah Division of Water Rights, was about 2 percent more than reported for 1979. The number of those wells 6 inches (152 mm) or more in diameter drilled for public supply, irrigation, and industrial use was about 18 percent less than reported for 1979.

The larger ground-water basins and those containing most of the ground-water development in Utah are shown in figure 1. Table 2 gives information about the number of wells constructed, withdrawals of water from wells for principal uses, and total withdrawals in 1980 for selected major ground-water basins. For comparison, total withdrawals in 1979 and average annual withdrawals during the 10-year period 1970-79 are also shown. Table 3 shows the annual withdrawals from the major basins for the period 1970-79.

MAJOR AREAS OF GROUND-WATER DEVELOPMENT

CACHE VALLEY

by D. A. Bischoff

Approximately 25,000 acre-feet (31 hm^3) of water was withdrawn from wells in Cache Valley during 1980. This was 3,000 acre-feet (3.7 hm^3) less than the amount withdrawn in 1979 and 1,000 acre-feet (1.2 hm^3) less than the 1970-79 average annual withdrawal (table 2). The decrease was due to above-average precipitation and above-average surface-water supplies available for irrigation. Discharge of the Logan River during 1980 was 199,500 acre-feet (270 hm^3), 111 percent of the 1941-80 average discharge.

Water levels rose in the central part of the valley (fig. 2) due to above-average precipitation and the consequent increase of the available surface-water supply for irrigation, resulting in a lesser demand on withdrawals from the ground-water reservoir. The slight declines in the southern part of the valley probably were due to late-season withdrawals from wells. The declines in the northern part of the valley were due to below-average precipitation in January-February 1981. This was in contrast to the above-average precipitation in January-February 1980 that had resulted in a rise of water levels in that part of the valley in the spring of 1980.

The long-term trend of the water level in well (A-12-1)29cab-1, the annual discharge of the Logan River near Logan, and the cumulative departure from the annual precipitation at Logan Utah State University are shown in figure 3 along with annual withdrawals from wells. Precipitation at Logan Utah State University during 1980 was 7.52 inches (191 mm) above the 1941-80 average.

The above-average precipitation resulted in above-average streamflow and decreased ground-water withdrawals in most of the valley.

EAST SHORE AREA

by Melanie E. Smith

The withdrawal of water from wells in the East Shore area in 1980 was about 51,000 acre-feet (63 hm^3), the same amount as reported for 1979 and 7,000 acre-feet (8.6 hm^3) more than the 1970-79 annual average withdrawal (table 2). Decreases in withdrawal of water for public supply were mainly offset by increases in withdrawal for industry.

Water levels rose from March 1980 to March 1981 in most of the East Shore area (fig. 4). The rise was due to decreased withdrawal from public-supply wells and above-average precipitation during 1980.

The long-term relation of water levels in selected wells to precipitation at Ogden Pioneer powerhouse and withdrawals from wells is shown in figure 5. The annual precipitation of 27.36 inches (695 mm) for 1980 was 6.41 inches (163 mm) above the 1937-80 average. The above-average precipitation is reflected by a rise in water levels in three of the four observation wells for which hydrographs are shown.

JORDAN VALLEY

by E. C. Gerhart

Withdrawal of water from wells in the Jordan Valley in 1980 was 128,000 acre-feet (158 hm^3), 8,000 acre-feet (9.9 hm^3) less than the amount in 1979 and 4,000 acre-feet (4.9 hm^3) more than the annual average for 1970-79 (table 2). Withdrawals in 1980 for irrigation, industrial use, and domestic and stock decreased by about 3, 14, and 3 percent, respectively, from the previous year. The decreases were probably due to above-average precipitation and consequent increased availability of surface water. The same factors probably caused the 3-percent decrease in withdrawals for public supply, despite the increase of population (fig. 6). There was also some decrease in withdrawals for industrial use due to increased usage of recycled water.

Water levels in the Jordan Valley during the period February 1980 to February 1981 showed an average net decline of 0.5 foot (0.15 m). Water levels rose in about 32 percent of the valley and declined in about 68 percent. The decline was less than 2 feet (0.6 m) in about 55 percent of the valley, from 2 to 4 feet (0.6 to 1.2 m) in about 8 percent, and more than 4 feet (1.2 m) in about 5 percent. The largest declines were in four small areas—one in the central part, one near the south end, and two in the southeast part of the valley (fig. 7). The declines probably were due to late-season heavy pumping in these areas.

The relation between water levels in selected wells and precipitation is shown in figure 8. Precipitation at Silver Lake Brighton during 1980 was 3.91 inches (99 mm) above the average for 1931-80. The above-average precipitation and the resultant decrease in withdrawals from wells is reflected in a rise of water levels in three of the five observation wells.

Water-level contours depicting the altitude and configuration of the potentiometric surface in the Jordan Valley are shown in figure 9.

TOOELE VALLEY

by Judy I. Steiger

Withdrawal of water from wells in Tooele Valley during 1980 was approximately 27,000 acre-feet (33 hm^3). This amount is 3,000 acre-feet (3.7 hm^3) less than reported for 1979 and 2,000 acre-feet (2.5 hm^3) less than the average annual withdrawal for the previous 10 years (table 2). The decrease was due to decreased withdrawal for irrigation and public supply because of above-average precipitation.

The discharge from springs was approximately 17,000 acre-feet (21 hm^3), which is 2,000 acre-feet (2.5 hm^3) more than reported for 1979. About 3,000 acre-feet (3.7 hm^3) of the spring discharge was used for irrigation and stock in the valley, and about 14,000 acre-feet (17 hm^3) was diverted to the Jordan Valley for industrial use.

Ground-water levels in the valley generally rose except in the east-central part and locally northeast of Grantsville (fig. 10). The rises were due chiefly to above-average precipitation and decreased ground-water withdrawals. The declines in the east-central part of the valley were due to a decrease in recharge resulting from a decrease in the amount of water discharged into the valley as a result of mining operations in the Oquirrh Mountains.

The relationship of water levels in selected observation wells to precipitation at Tooele and annual withdrawal from wells is shown in figure 11. Water levels declined in four of the observation wells and rose in one. Precipitation at Tooele in 1980 was 112 percent of the 1963-80 annual average.

UTAH AND GOSHEN VALLEYS

by Cynthia L. Appel

Withdrawal of water from wells in Utah and Goshen Valleys in 1980 was about 97,000 acre-feet (120 hm^3). This was 11,000 acre-feet (14 hm^3) less than reported for 1979 and 2,000 acre-feet (2.5 hm^3) less than the 1970-79 annual average (table 2). Withdrawal for public supply and industry decreased by 7,400 acre-feet (9.1 hm^3) and 400 acre-feet (0.5 hm^3). Total withdrawal for irrigation decreased by about 4,000 acre-feet (4.9 hm^3); however, in Goshen Valley withdrawal for irrigation increased by 3,000 acre-feet (3.7 hm^3). The general decrease in ground-water withdrawals may be attributed to above-average precipitation. In Utah Valley, 75,000 acre-feet (92 hm^3) of water was withdrawn in 1980 or 14,000 acre-feet (17 hm^3) less than in 1979. In Goshen Valley, 22,000 acre-feet (27 hm^3) of water was withdrawn in 1980, or about 3,000 acre-feet (3.7 hm^3) more than in 1979.

Water levels in most observation wells in Utah Valley rose from March 1980 to March 1981 (figs. 12-15). The general rise was due to decreased ground-water withdrawal and above-average precipitation. Water levels in most observation wells in Goshen Valley declined. The decline was due to increased ground-water withdrawal.

The relation of water levels in three observation wells to precipitation at Alpine and Spanish Fork powerhouse and annual withdrawal from wells is shown in figure 16.

JUAB VALLEY

by V. L. Jensen

Withdrawal of water from wells in Juab Valley during 1980 was about 15,000 acre-feet (18 hm^3), a decrease of 6,000 acre-feet (7.4 hm^3) from the amount reported for 1979 but 9,000 acre-feet (11 hm^3) less than the 1970-79 average (table 2). The decrease in withdrawals was due to above-average precipitation and the resultant increase in surface water available for irrigation.

From March 1980 to March 1981, water levels rose throughout the valley. The rises were due to the above-average precipitation and the consequent increase of surface water available for irrigation. Rises were more than 15 feet (4.6 m) in the Levan area and more than 10 feet (3.0 m) in the Nephi area (fig. 17).

The relation of water levels in two observation wells to cumulative departure from the 1935-80 average annual precipitation at Nephi and to annual withdrawals from wells is shown in figure 18. Precipitation at Nephi during 1980 was 18.03 inches (458 mm), 4.43 inches (112 mm) above the 1935-80 average.

SEVIER DESERT

by Michael Enright

Withdrawal of water from wells in the Sevier Desert in 1980 was about 14,000 acre-feet (17 hm^3), which was 31,000 acre-feet (38.2 hm^3) less than was reported for 1979 and about 17,000 acre-feet (21 hm^3) less than the annual average withdrawal for the previous 10 years, 1970-79 (table 2). The decrease from 1979 to 1980 was due to the availability of more surface water for irrigation. During 1980, the Sevier River near Juab discharged 199,900 acre-feet (247 hm^3) (fig. 21). This was 74,200 acre-feet (91 hm^3) more than the 1979 discharge and about 58,700 acre-feet (72 hm^3) more than the average discharge for 1935-80.

In those parts of the Sevier Desert where observation wells are located, water levels rose from March 1980 to March 1981 in more than 83 percent of the lower artesian aquifer and in more than 92 percent in the upper artesian aquifer (figs. 19 and 20). The largest observed water-level rise in the lower artesian aquifer was 17.2 feet (5.2 m) 1 mile (1.6 km) north of Oak City. The largest observed rise in the upper artesian aquifer was 10.5 feet (3.2 m) about 3 miles (4.8 km) southeast of Leamington. These rises can be attributed to above-average precipitation and a decrease in the withdrawal of ground water for irrigation. Observed water-level declines in both artesian aquifers were all less than 1 foot (0.3 m).

The long-term relation of precipitation at Oak City, discharge of the Sevier River near Juab, water levels in selected wells, and annual withdrawals from wells are shown in figure 21. Precipitation at Oak City in 1980 was 5.66 inches (144 mm) above the 1935-80 annual average. Water levels rose in the three observation wells because of decreases in ground-water withdrawals, and above-average precipitation.

SANPETE VALLEY

by David Allen

Approximately 13,000 acre-feet (16 hm^3) of water was withdrawn from wells in Sanpete Valley during 1980 (table 2). This is approximately 32 percent less than the amount withdrawn in

1979 and about 35 percent less than the average annual withdrawal from 1970 to 1979 (table 2). The decrease in the amount of water withdrawn during 1980 was due to the increased amount of surface water available for irrigation.

Ground-water levels rose in the southern half of Sanpete Valley proper and in most of the Fairview arm of the valley (fig. 22). Rises of more than 8 feet (2.4 m) were measured in isolated areas south of Mayfield and northwest of Ephraim. Rises ranging from 6.2 feet (1.9 m) to 7.3 feet (2.2 m) were measured in an area just south of Ephraim. These rises are due to decreased withdrawal and increased infiltration of runoff at the mouths of canyons. Declines of water levels of less than 4 feet (1.2 m) were measured in most of the Fountain Green arm, the area around Moroni and south of Chester, and in the north and west parts of the Fairview arm. These declines were probably due to late-season withdrawals for irrigation.

Long-term hydrographs of water levels in three wells in Sanpete Valley, the long-term trend of precipitation at Manti, and annual withdrawal from wells are shown in figure 23. Precipitation at Manti was 18.5 inches (470 mm), approximately 46 percent above the 46-year average of 12.71 inches (320 mm).

UPPER AND CENTRAL SEVIER VALLEYS AND UPPER FREMONT RIVER VALLEY

by D. C. Emett

Withdrawal of water from wells in the upper and central Sevier Valleys and upper Fremont River valley was approximately 24,000 acre-feet (30 hm^3) in 1980, the same as in 1979 (table 2). Above-average streamflow resulted in decreased irrigation withdrawals; however, domestic and stock usage and use for public supply increased. These increases probably reflect below-average summer precipitation.

Water levels in most observation wells generally rose from March 1980 to March 1981 (fig. 24). A maximum rise of 6.7 feet (2.0 m) was measured in a well near Richfield. The rises are due to above-average precipitation and increased availability of surface water. Local declines of as much as 2 feet (0.6 m) occurred in flowing wells near the Fremont River.

The relation of water levels in three wells to discharge of the Sevier River at Hatch, to precipitation at Panguitch, Salina, and Loa, and to annual withdrawals from wells is shown in figure 25. Precipitation at the three sites was above average, and water levels rose in all three observation wells. The rises north of Panguitch and northwest of Salina probably reflect the above-average runoff of the Sevier River.

PAVANT VALLEY

by G. W. Sandberg

Withdrawal of water from wells in Pavant Valley in 1980 was 75,000 acre-feet (92 hm^3), which was 11,000 acre-feet (13 hm^3) less than reported for 1979 and 15,000 acre-feet (18 hm^3) less than the 1970-79 annual average (table 2). The decrease in withdrawals was due to above-average precipitation and increased supplies of surface water available for irrigation.

Water levels rose from March 1980 to March 1981 in about 87 percent of the wells measured and declined in about 13 percent. The rises were due to above-average precipitation and the decrease of withdrawals for irrigation, whereas, declines of less than 2 feet (0.6 m) were due to local withdrawals from wells. Areas of rises and declines are shown in figure 26. The maximum observed rise was 16.5 feet (5.0 m) in a well north of McCornick, and the largest decline was 1.8 feet (0.5 m) in a well between Meadow and Kanosh.

The relation of water levels in selected wells, withdrawals from wells, and cumulative departure from average annual precipitation at Fillmore is shown in figure 27. Of five observation wells for which data are available for March 1980, water levels declined in two and rose in three. Precipitation at Fillmore was 3.37 inches (86 mm) above the 1931-80 average in 1980.

Figure 28 shows variations of dissolved-solids concentrations in water from four wells in Pavant Valley. In 1980, the concentration increased in water from one well and decreased in water from two. No sample was obtained from the fourth well.

CEDAR CITY VALLEY

by R. C. Beard

Withdrawal of water from wells in Cedar City Valley during 1980 was approximately 28,000 acre-feet (35 hm^3), a decrease of 4,000 acre-feet (4.9 hm^3) from the amount reported in 1979, and 6,000 acre-feet (7.4 hm^3) less than the average annual withdrawal for the previous 10 years (table 2). The decrease in withdrawal was due to above-average precipitation and the consequent increase of surface water available for irrigation.

Water levels rose in most of Cedar City Valley from March 1980 to March 1981 (fig. 29). The rises were due to decreased withdrawals from wells and increased recharge to the ground-water reservoir due to above-average precipitation and above-average streamflow. The greatest rises, which were more than 8 feet (2.4 m), occurred along the east side of the valley from Enoch to Hamilton Fort. The largest rise, about 15 feet (4.6 m), occurred at the mouth of Coal Creek in response to the above-average discharge of the creek. Declines of less than 1 foot (0.3 m) occurred in the northern part of the valley. The declines of up to 1 foot (0.3 m) probably resulted from locally large withdrawals for irrigation.

Figure 30 shows water levels in well (C-35-11)33aac-1, cumulative departure from average annual precipitation at Cedar City, discharge from Coal Creek, and average annual withdrawals from wells in Cedar City Valley. The water-level rise in well (C-35-11)33aac-1 reflects the above-average precipitation and discharge of Coal Creek.

PAROWAN VALLEY

by L. G. Sultz

Withdrawal of water from wells in Parowan Valley was about 28,000 acre-feet (35 hm^3) in 1980. This was 2,000 acre-feet (2.5 hm^3) less than reported for 1979 and 1,000 acre-feet (1.2 hm^3) less than the 1970-79 average annual withdrawal (table 2). Withdrawals for irrigation and public supply declined, whereas, withdrawals for domestic, stock, and industrial use were the same as reported for 1979.

In the southern part of the valley, water levels generally rose (fig. 31) due to increases in precipitation and surface-water supplies as well as decreased withdrawals from wells. In the northern part of the valley, water levels declined slightly due mainly to late-season withdrawals.

The relation of water levels in well (C-34-8)5bca-1 to annual withdrawals from wells and cumulative departure from the annual average precipitation at Parowan Airport is shown in figure 32. The water level in well (C-34-8)5bca-1 continued to decline for the sixth straight year due to large local withdrawals from wells.

ESCALANTE VALLEY

Milford area

by M. R. Eckenwiler

Withdrawal of water from wells in the Milford area in 1980 was about 61,000 acre-feet (75 hm^3), 12,000 acre-feet (30 hm^3) more than the 1979 withdrawal, and 1,000 acre-feet (1.2 hm^3) more than the 1970-79 average annual withdrawal (table 2). The increase was due to increased withdrawal of water for irrigation.

Water levels from March 1980 to March 1981 generally declined less than 1 foot (0.3 m) in the northeast and south-central parts of the Milford area (fig. 33). In the heavily pumped area between Minersville and Milford, however, water levels rose as much as 9 feet (2.7 m) as a result of increased recharge from the Beaver River. The river discharged 53,680 acre-feet (66 hm^3) in 1980, about 28,000 acre-feet (34 hm^3) more than the 1932-80 average annual discharge. The Beaver River channel is usually dry north of Minersville, but in the spring of 1980, streamflow in the channel extended to within about 5 miles (8.0 km) of Milford.

The relation of water levels in well (C-29-10)6ddc-2 to precipitation at Milford Airport, discharge of the Beaver River at Rocky Ford Dam, near Minersville, and annual withdrawals of water from wells is shown in figure 34. The water-level rise in well (C-29-10)6ddc-2 reflects the above-average precipitation at Milford and increased recharge resulting from the above-average flow in the Beaver River.

Water-level contours depicting the altitude and configuration of the potentiometric surface in the Milford area are shown in figure 35.

ESCALANTE VALLEY

Beryl-Enterprise area

by G. W. Sandberg

Withdrawal of water from wells in the Beryl-Enterprise area in 1980 was about 71,000 acre-feet (88 hm^3), a decrease of 8,000 acre-feet (9.9 hm^3) from the amount reported in 1979 and 7,000 acre-feet (8.6 hm^3) less than the 1970-79 annual average (table 2). The decrease was due to above-average precipitation. Much of the precipitation fell during the spring of 1980, causing extensive flooding in the southern part of the area.

Water levels rose in the heavily pumped Enterprise-Beryl Junction-Newcastle area (fig. 36) as a result of the above-average precipitation and consequent flooding of Shoal, Mountain Meadow, and Pinto Creeks during the winter and spring of 1980. The largest recorded rise was 11.9 feet (3.6 m) in a well about 2 miles (3.2 km) northeast of Enterprise. Water levels also rose as much as 1 foot (0.3 m) in the northeast part of the area. Slight declines occurred in the north and northwestern part of the area. Large declines occurred in the immediate vicinity of Enterprise, indicating a return to pre-flood-induced water levels near the mouth of Shoal Creek. In the well with the largest decline, 18.2 feet (5.5 m), the water level had risen 19 feet (5.8 m) during the previous 2 years as a result of flooding in Shoal Creek. Shoal Creek was dry in the vicinity of that well during the winter of 1980 and the spring of 1981, resulting in a return to the pre-flood-induced water levels.

The relation of water levels in well (C-35-17)25dcd-1 to precipitation at Modena and annual withdrawals of water from wells is shown in figure 37. The water level in this well, which rose for the second consecutive year, showed the largest annual rise since 1962.

The changes in concentration of dissolved solids in the water from wells in the Beryl-Enterprise area are shown in figure 38. The concentration of dissolved solids decreased in a well in the southern part of the area because of the large amount of recharge from surface water of better quality. The concentration of dissolved solids increased in a well in the central part of the area because of the recirculation of ground water unmitigated by surface-water dilution.

OTHER AREAS

by L. R. Herbert

Approximately 105,000 acre-feet (130 hm^3) of water was withdrawn from wells in 1980 in those areas of Utah listed below:

Number in figure 1		Estimated withdrawal (acre-feet) 1980	1979
1	Grouse Creek valley	2,600	3,000
2	Park Valley	2,200	2,600
3	Curlew Valley	27,400	25,700
8	Ogden Valley	7,900	10,700
12	Dugway area (including Skull Valley north of area outlined in fig. 1)	3,800	4,400
13	Cedar Valley	4,300	4,400
23	Snake Valley	9,300	15,700
25	Beaver Valley	10,100	11,400
31	Central Virgin River area	19,000	19,900
	Remainder of State	18,400	24,500
	Total (rounded)	105,000	122,000

The total withdrawal was 17,000 acre-feet (21 hm^3) less than the amount reported for 1979 and 9,000 acre-feet (11 hm^3) more than the 1970-79 annual average (table 2). All areas reported, except Curlew Valley, had less withdrawals in 1980 than in 1979. The decrease in withdrawals from wells in 1980 was due to above-average precipitation and the consequent increase of surface-water supplies available for irrigation.

Figure 39 shows the relation between long-term hydrographs of observation wells in selected areas and cumulative departure from average annual precipitation at sites in or near those areas. Water levels rose in 8 of the 16 wells from March 1980 to March 1981. The rises were due generally to above-average precipitation and to decreased withdrawals from wells. Declines occurred mostly in wells in the northern and northeastern parts of the State. Figures 40 and 41 show changes of water levels in Cedar and Curlew Valleys from March 1980 to March 1981. Water levels rose in the western part of Cedar Valley; however, they declined in most of Curlew Valley where data are available and in the eastern part of Cedar Valley due to local increased withdrawals for irrigation.

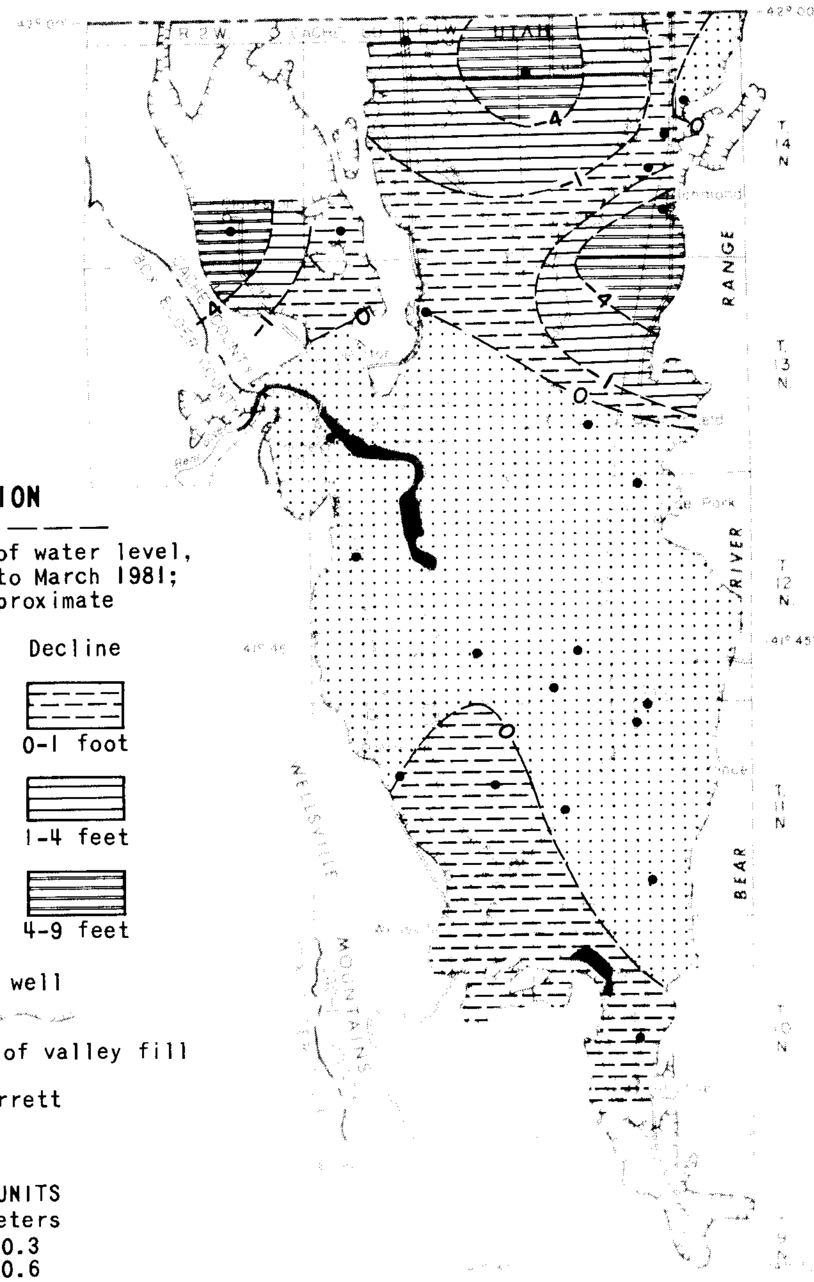
REFERENCES CITED

Herbert, L. R., and others, 1980, Ground-water conditions in Utah, spring of 1980: Utah Division of Water Resources Cooperative Investigations Report 19, 72 p.

National Oceanic and Atmospheric Administration, Environmental Data Service, 1981, Climatological data (annual summary, 1980): v. 80, no. 13.

ILLUSTRATIONS

On all maps showing changes in water levels, areas of water-level rise are indicated by dotted patterns, and areas of water-level decline are indicated by lined patterns



EXPLANATION

—4—
Line of equal change of water level, in feet, March 1980 to March 1981; dashed where approximate

Rise	Decline
0-2 feet	0-1 foot
	1-4 feet
	4-9 feet

Observation well

Approximate boundary of valley fill

by R. B. Garrett

CONVERSION UNITS

Feet	Meters
1	0.3
2	0.6
4	1.2
9	2.7

0 1 2 3 4 5 6 MILES

0 1 2 3 4 5 6 KILOMETERS

Figure 2.—Map of Cache Valley showing change of water levels from March 1980 to March 1981.

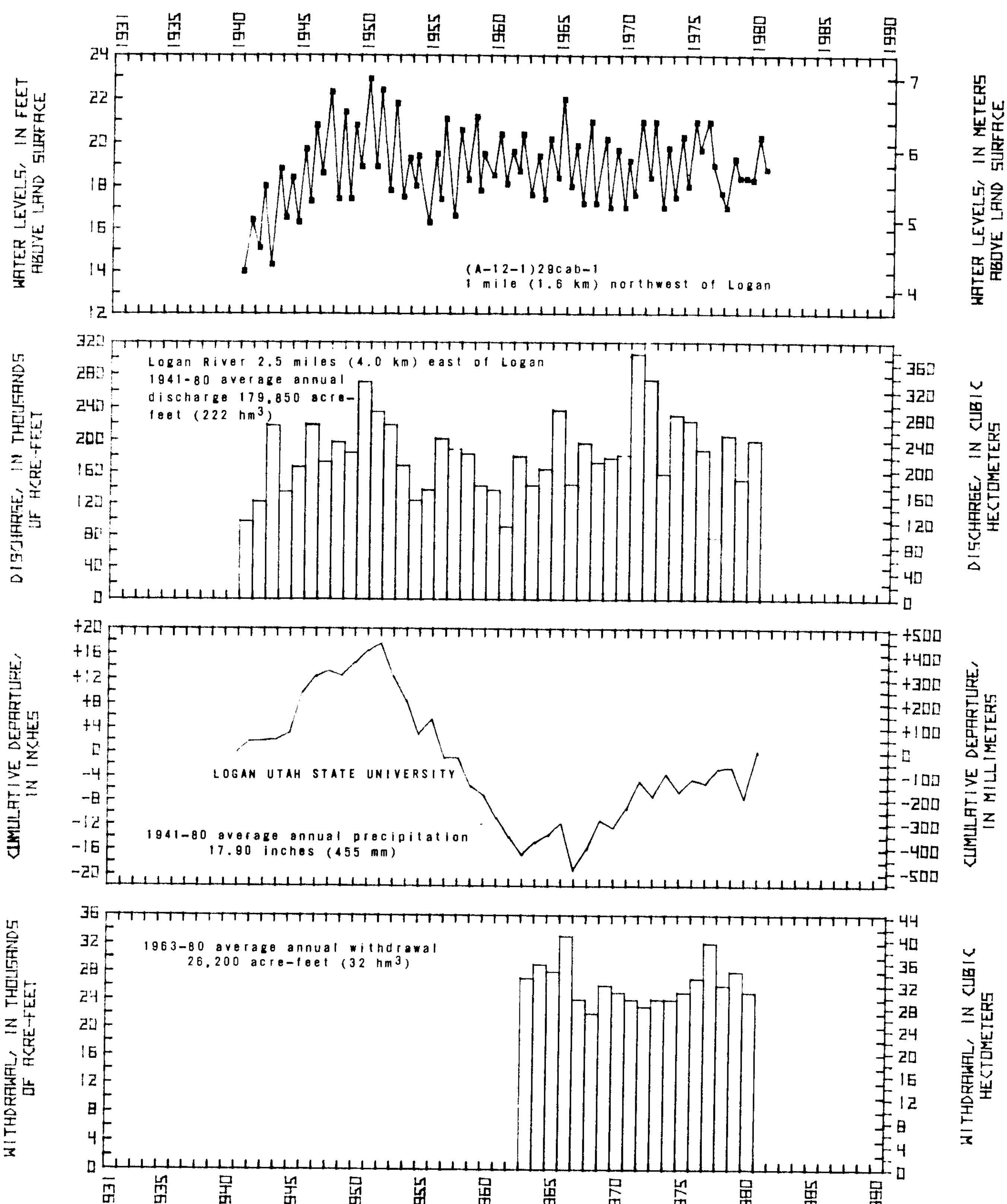


Figure 3.—Relation of water levels in well (A-12-1)29cab-1 in Cache Valley to discharge of the Logan River near Logan, to cumulative departure from the average annual precipitation at Logan Utah State University, and to annual withdrawals from wells.

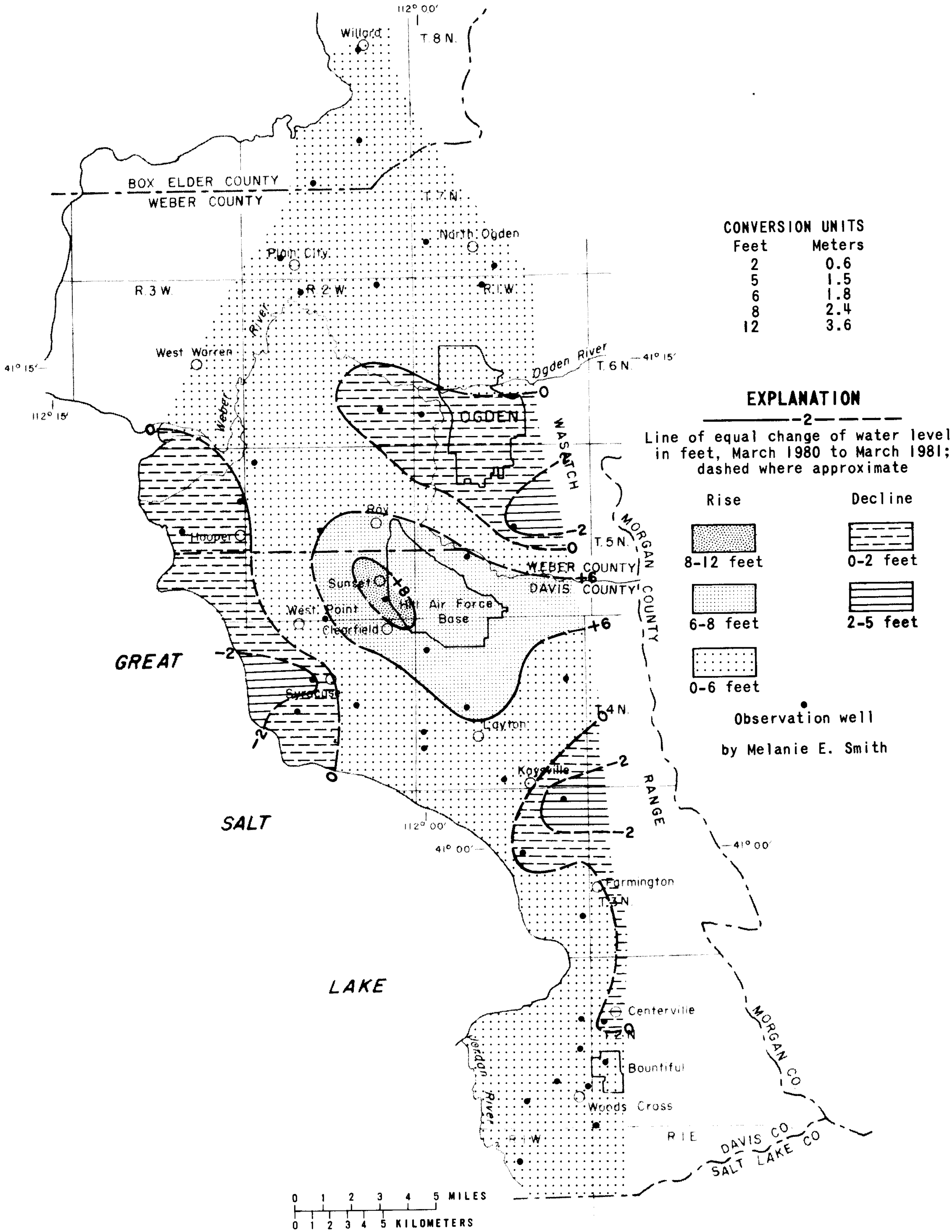


Figure 4.—Map of the East Shore area showing change of water levels from March 1980 to March 1981.

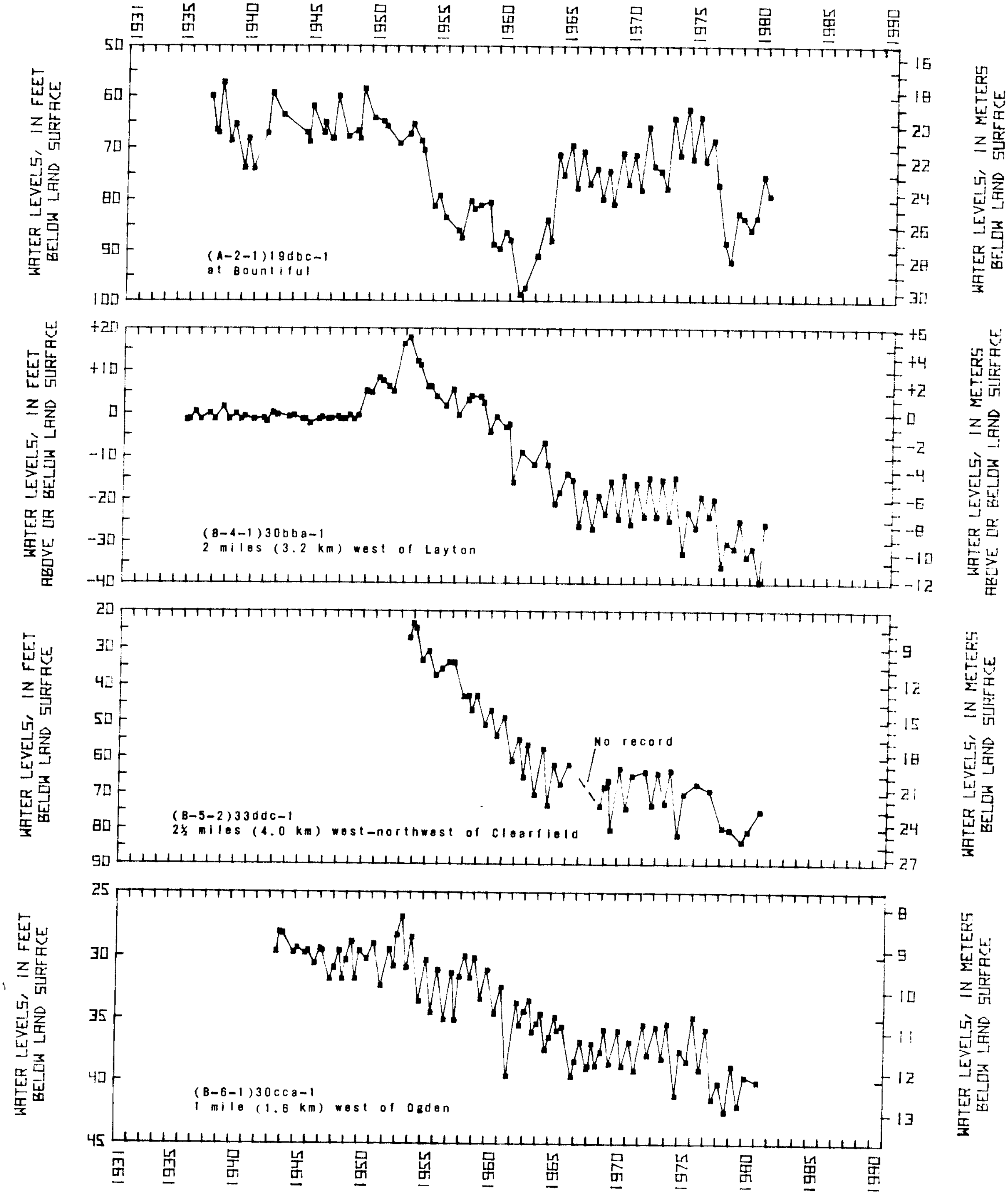


Figure 5.— Relation of water levels in selected wells in the East Shore area to cumulative departure from the average annual precipitation at Ogden Pioneer powerhouse and to annual withdrawals from wells.

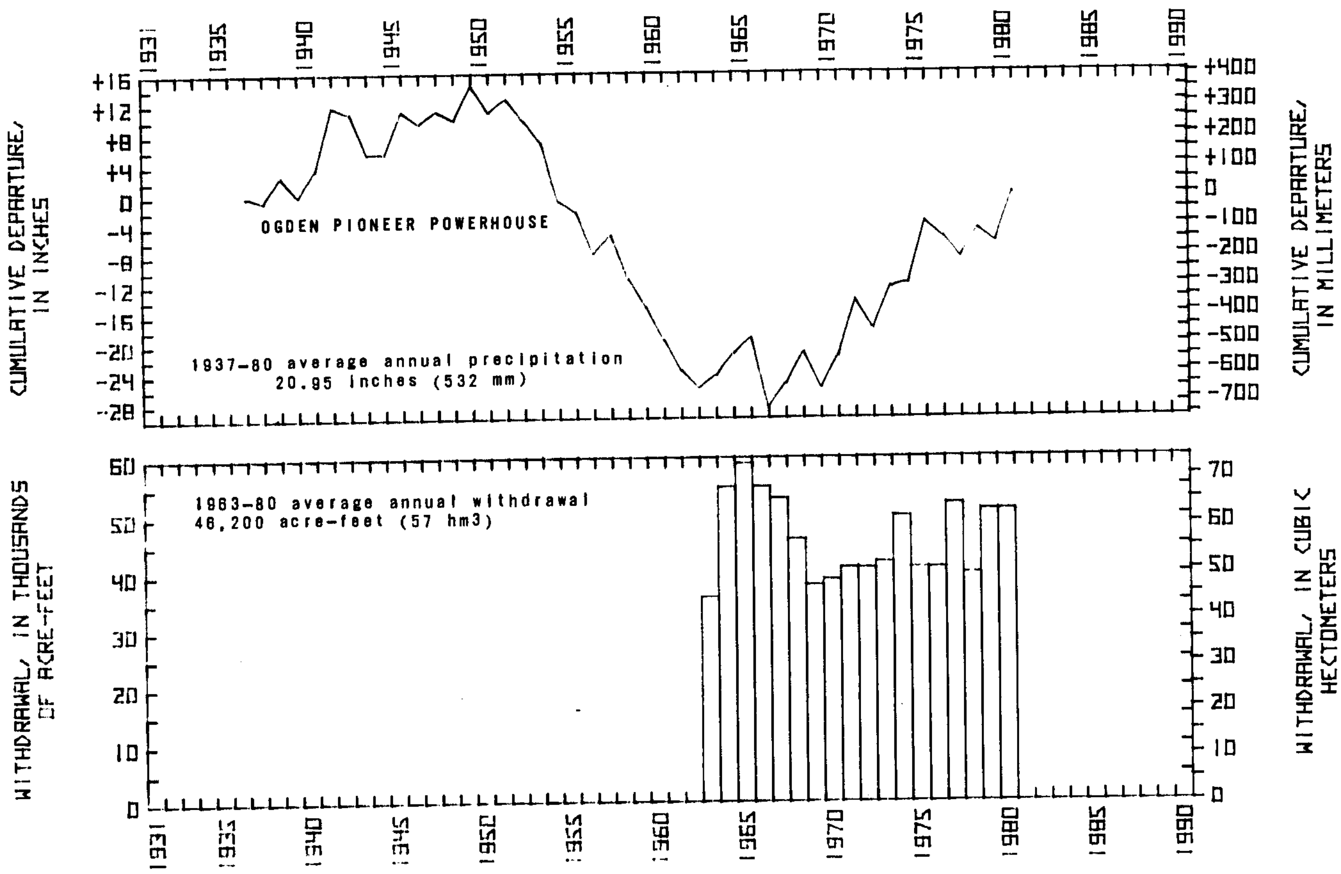


Figure 5.— Continued.

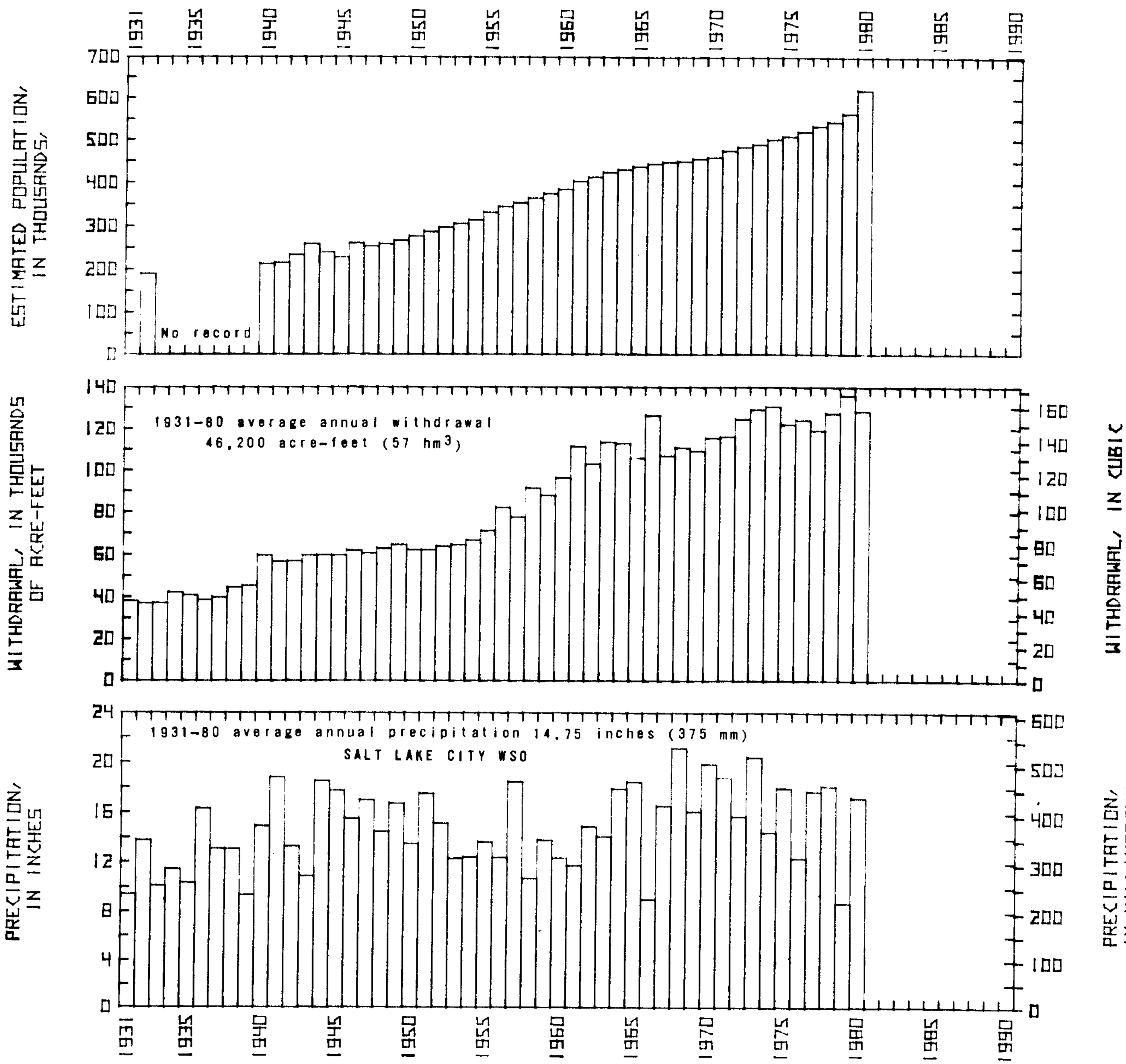


Figure 6.— Estimated population of Salt Lake County, annual withdrawals from wells, and annual precipitation at Salt Lake City WSO (International Airport) for the period 1931-80.

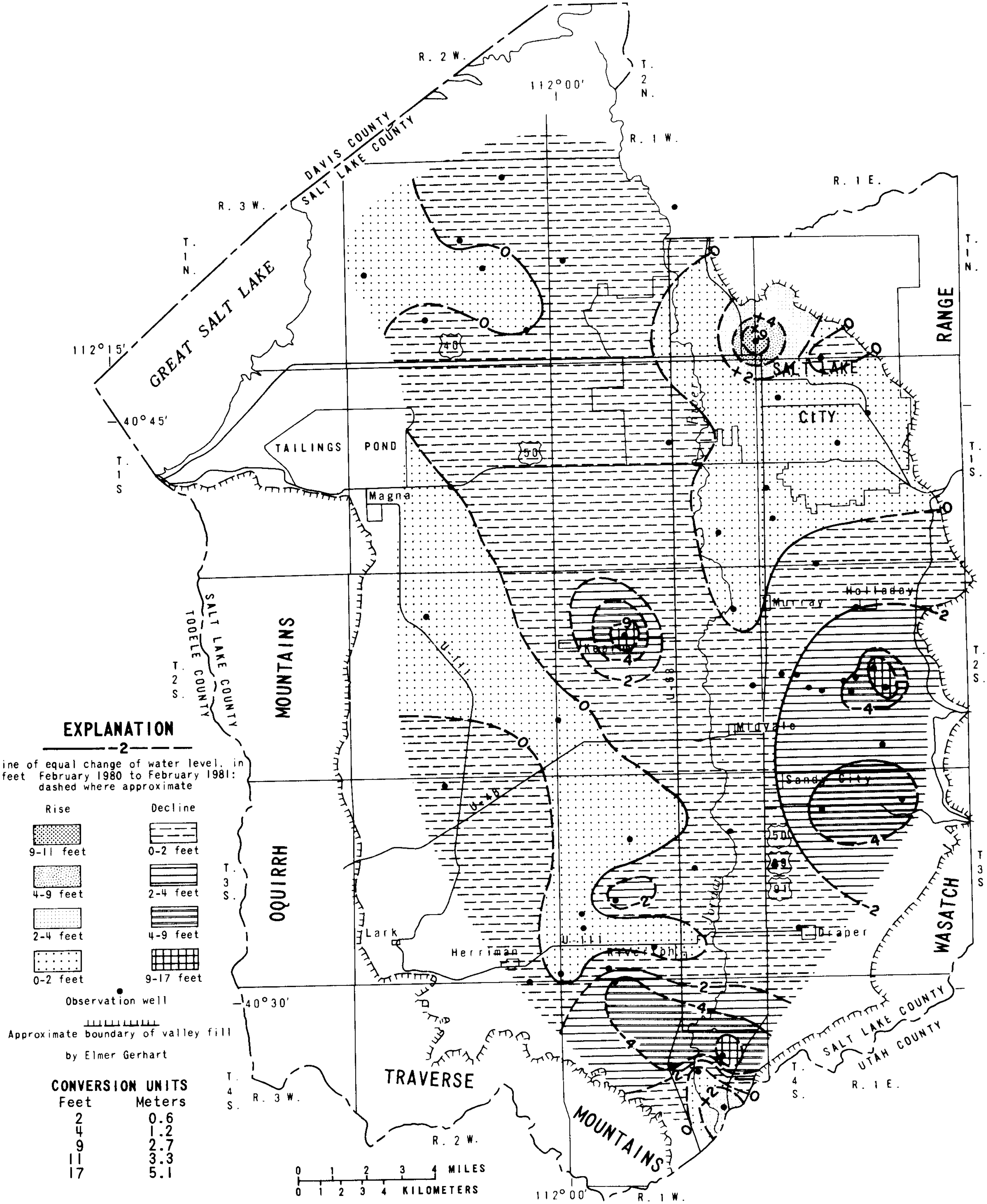


Figure 7.—Map of the Jordan Valley showing change of water levels from February 1980 to February 1981.

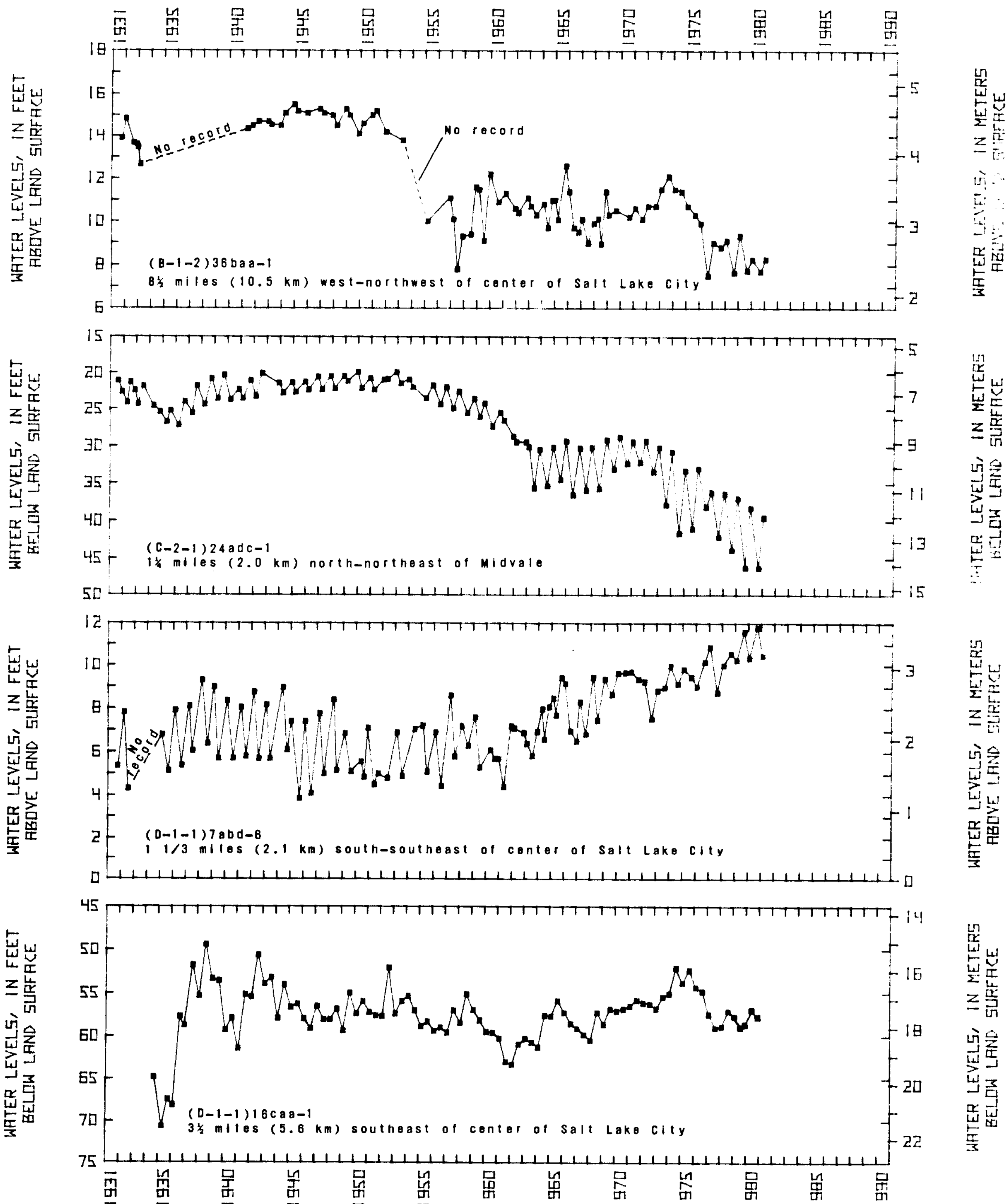


Figure 8.— Relation of water levels in selected wells in the Jordan Valley to cumulative departure from the average annual precipitation at Silver Lake Brighton.

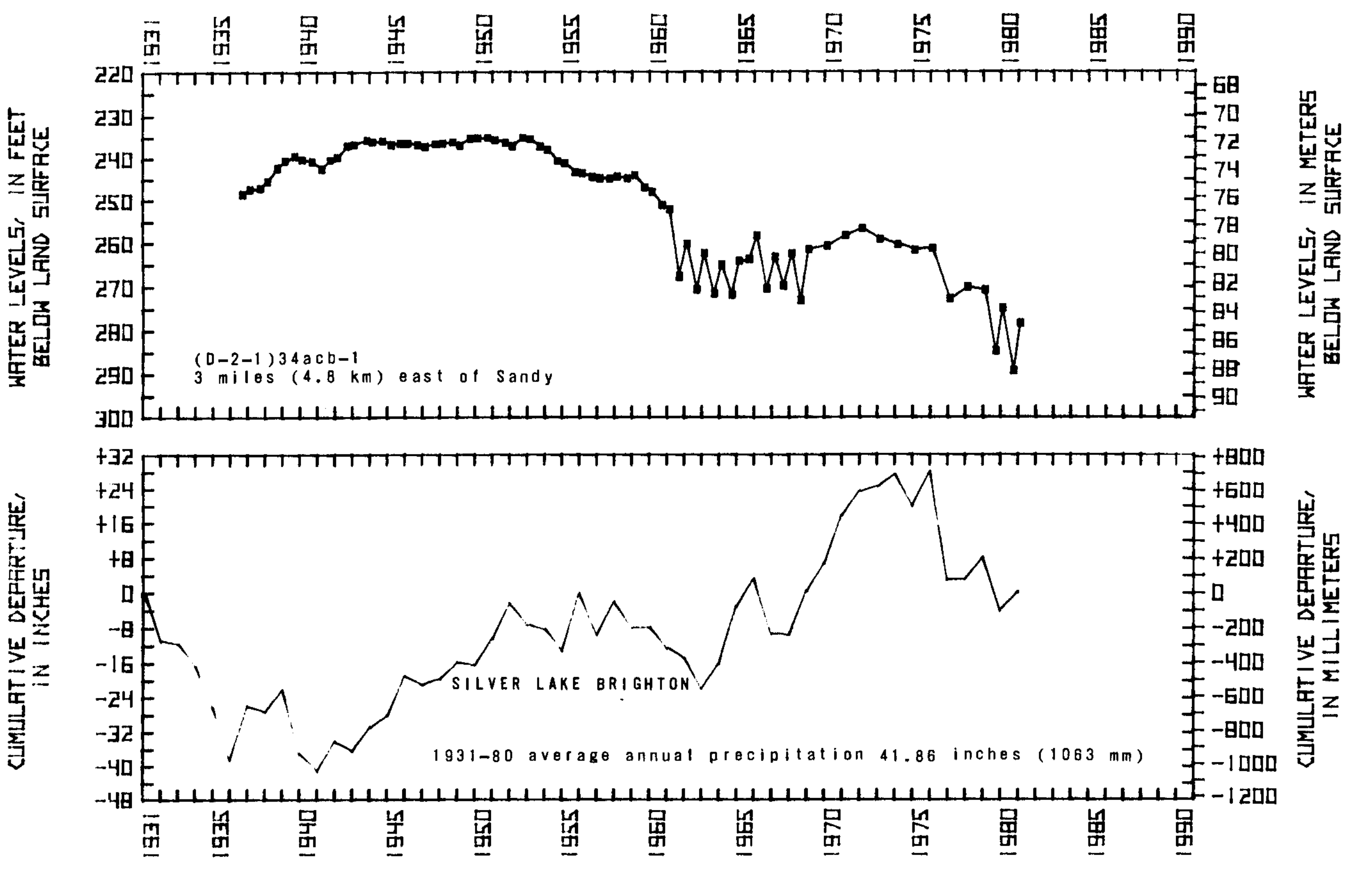


Figure 8.— Continued.

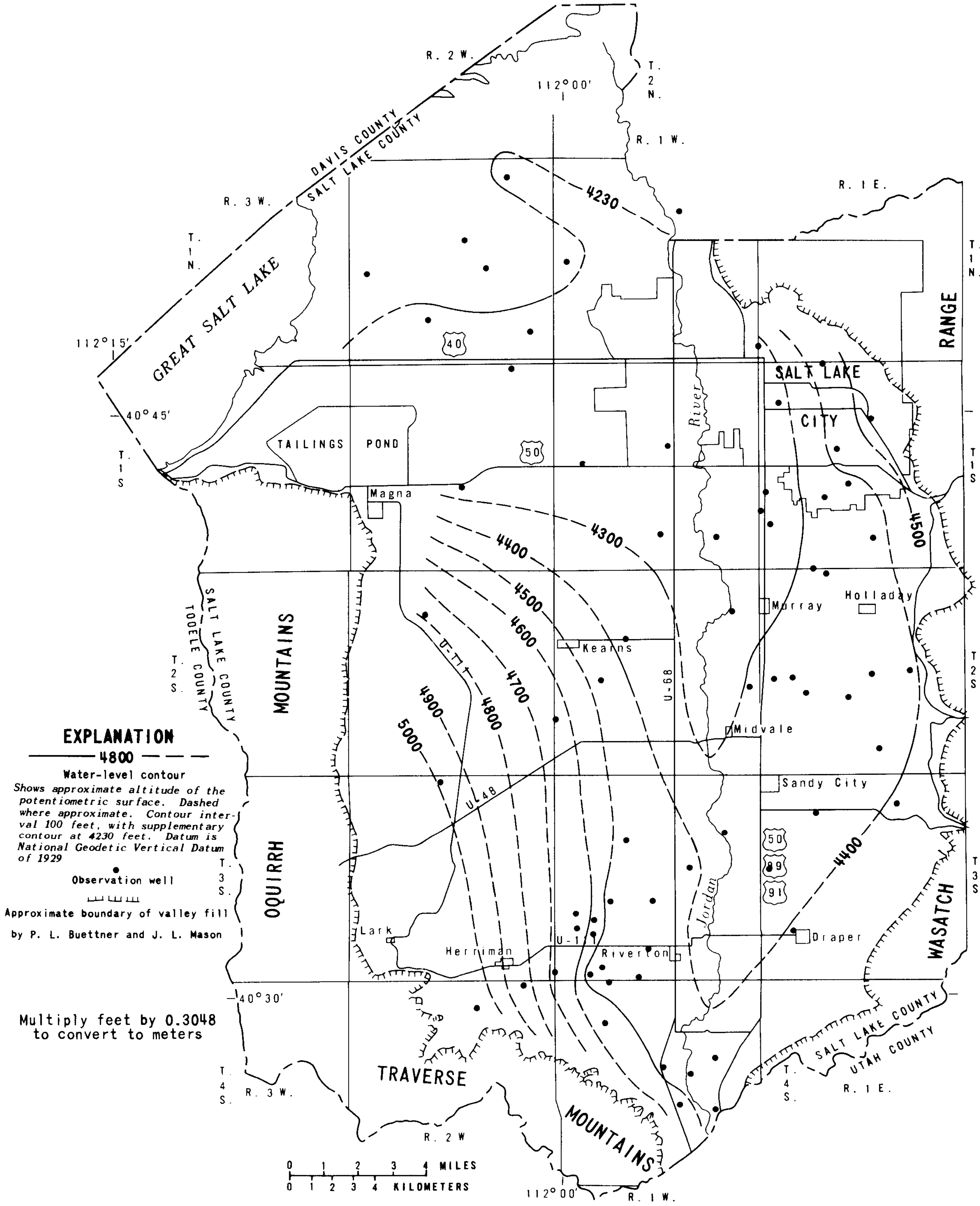


Figure 9.—Map of the Jordan Valley showing the approximate potentiometric surface, February 1981.

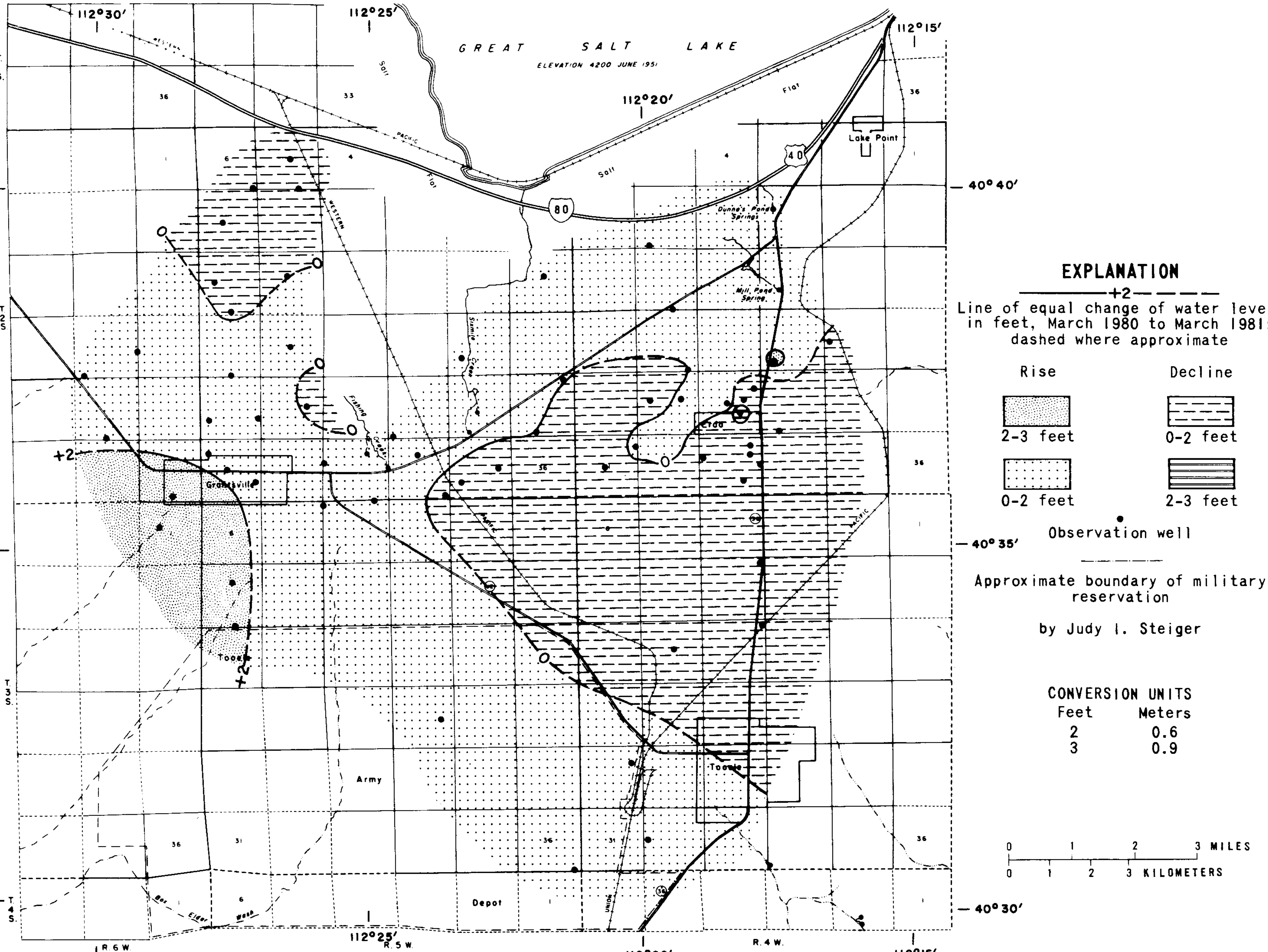


Figure 10.—Map of Tooele Valley showing change of water levels in artesian aquifers from March 1980 to March 1981.

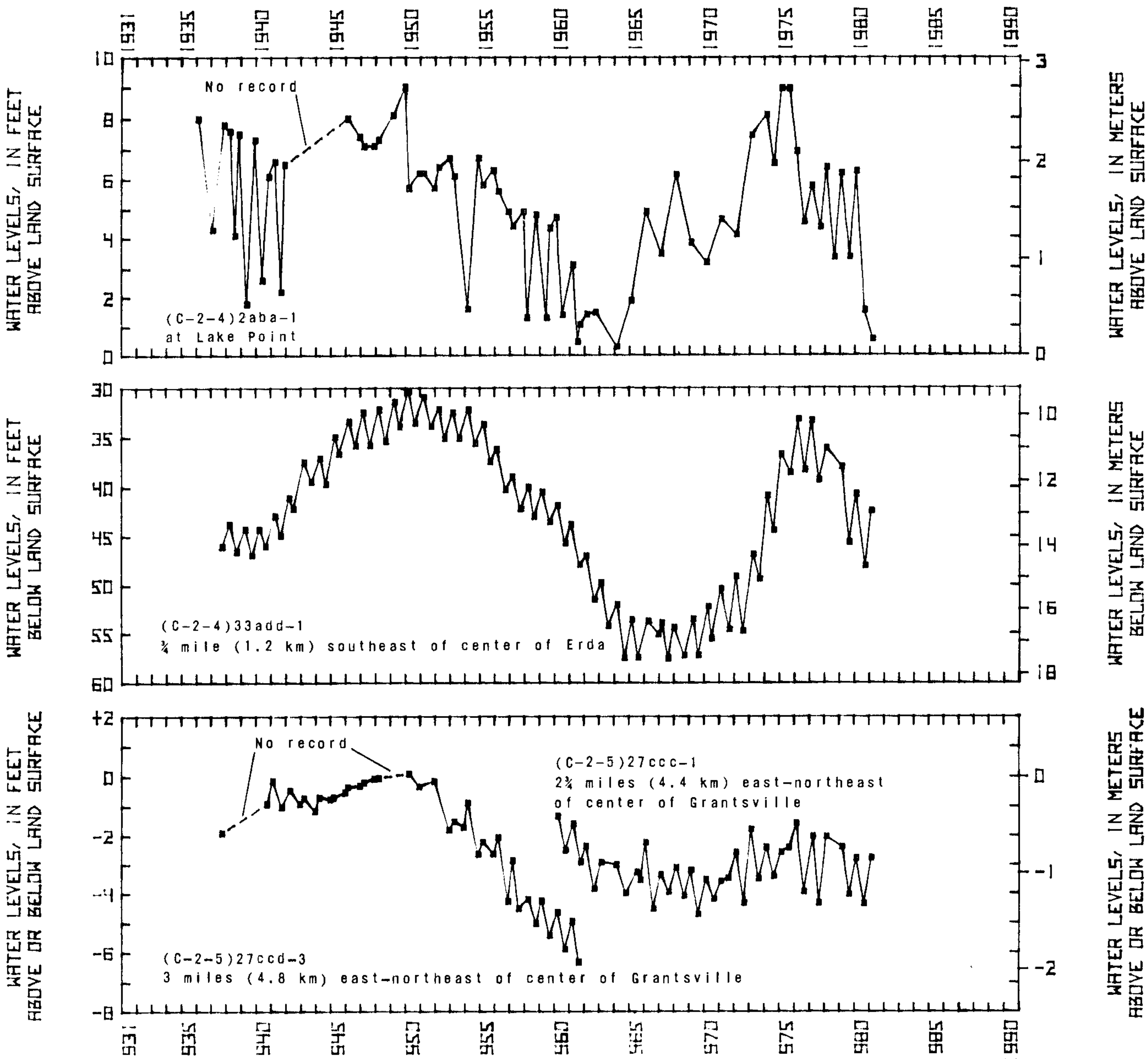


Figure 11.—Relation of water levels in selected wells in Tooele Valley to cumulative departure from the average annual precipitation at Tooele and to annual withdrawals from wells.

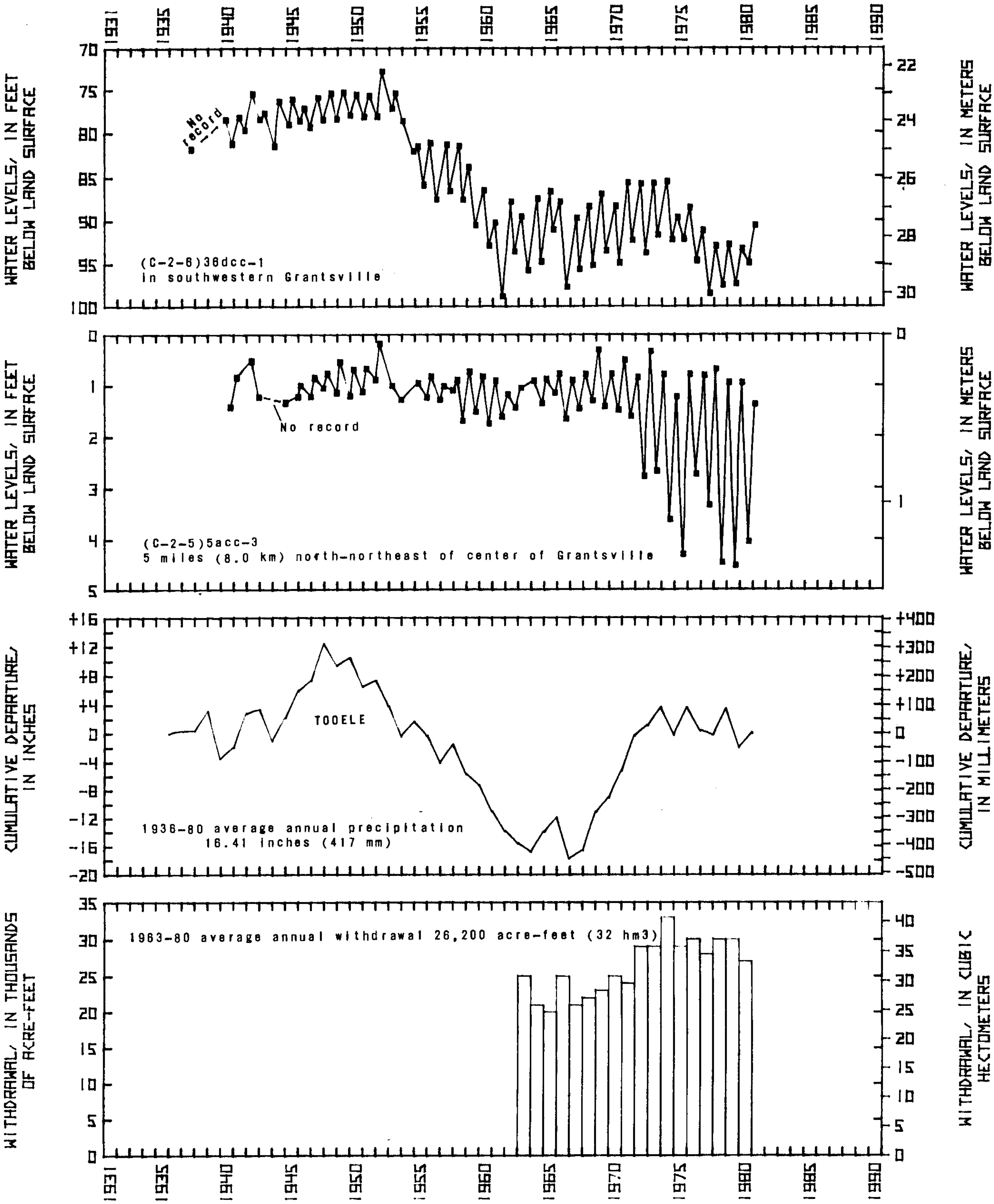


Figure 11.—Continued.

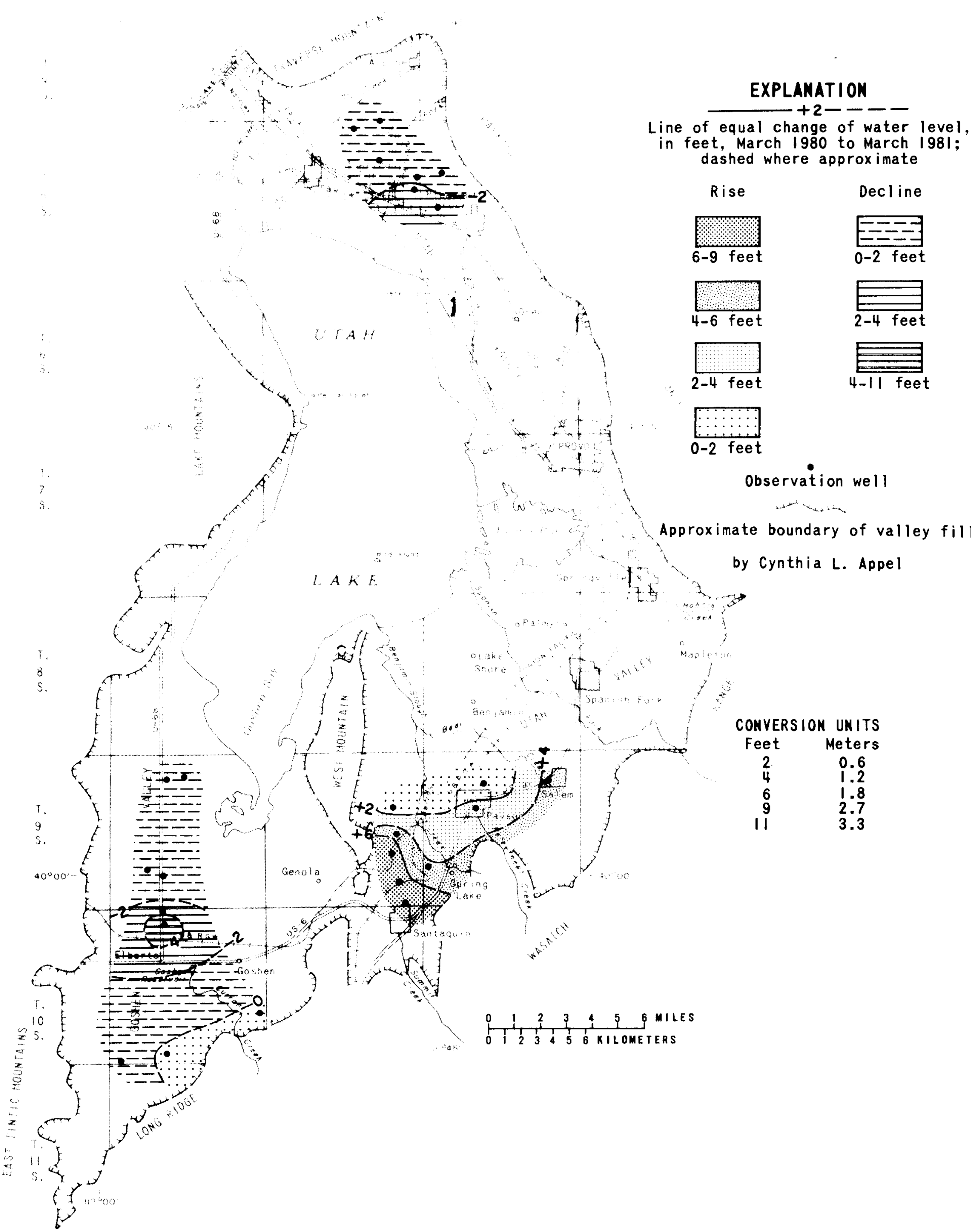


Figure 12.— Map of Utah and Goshen Valleys showing change of water levels in the water-table aquifers from March 1980 to March 1981.

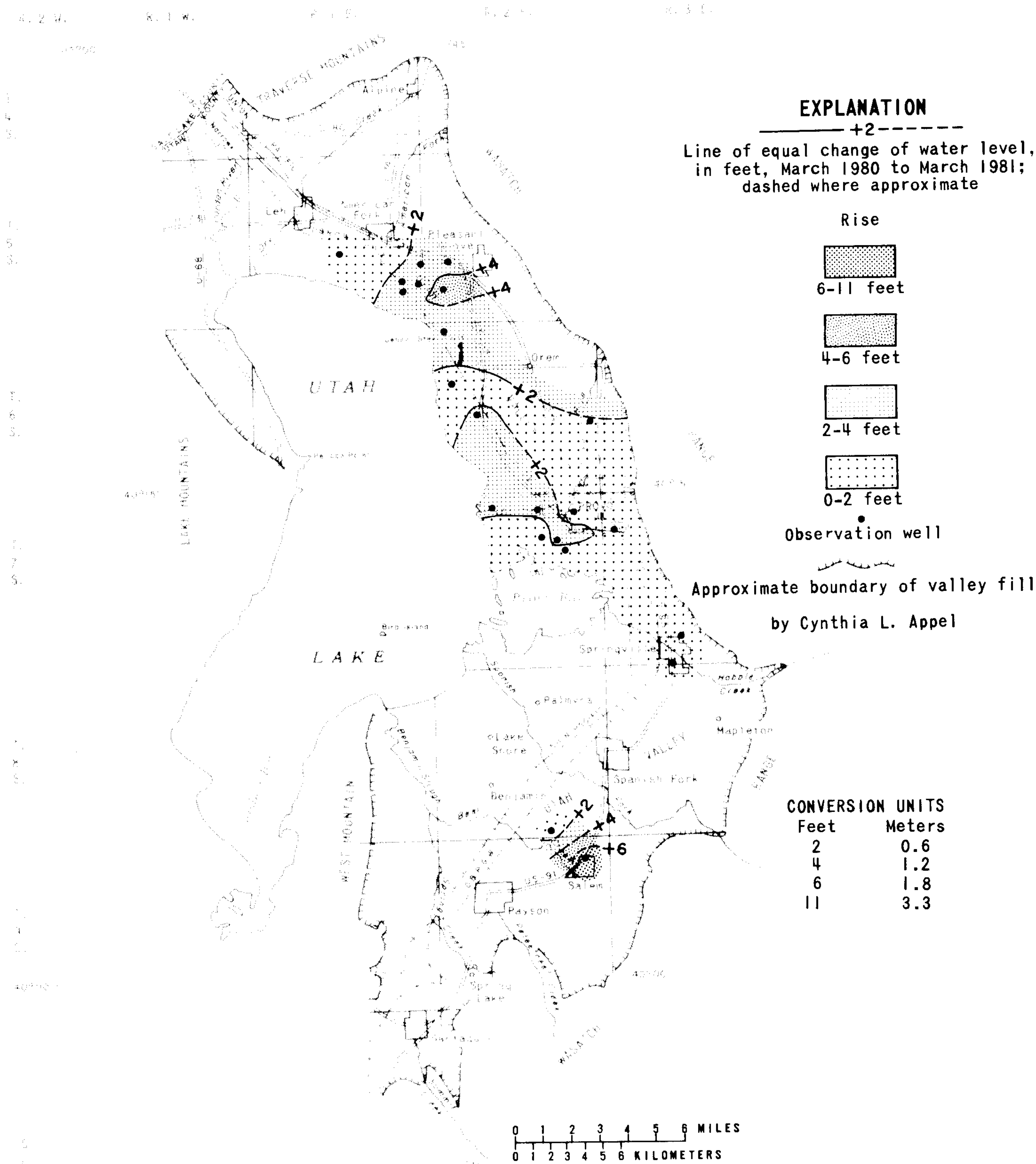


Figure 13.—Map of Utah Valley showing change of water levels in the shallow artesian aquifer in rocks of Pleistocene age from March 1980 to March 1981.

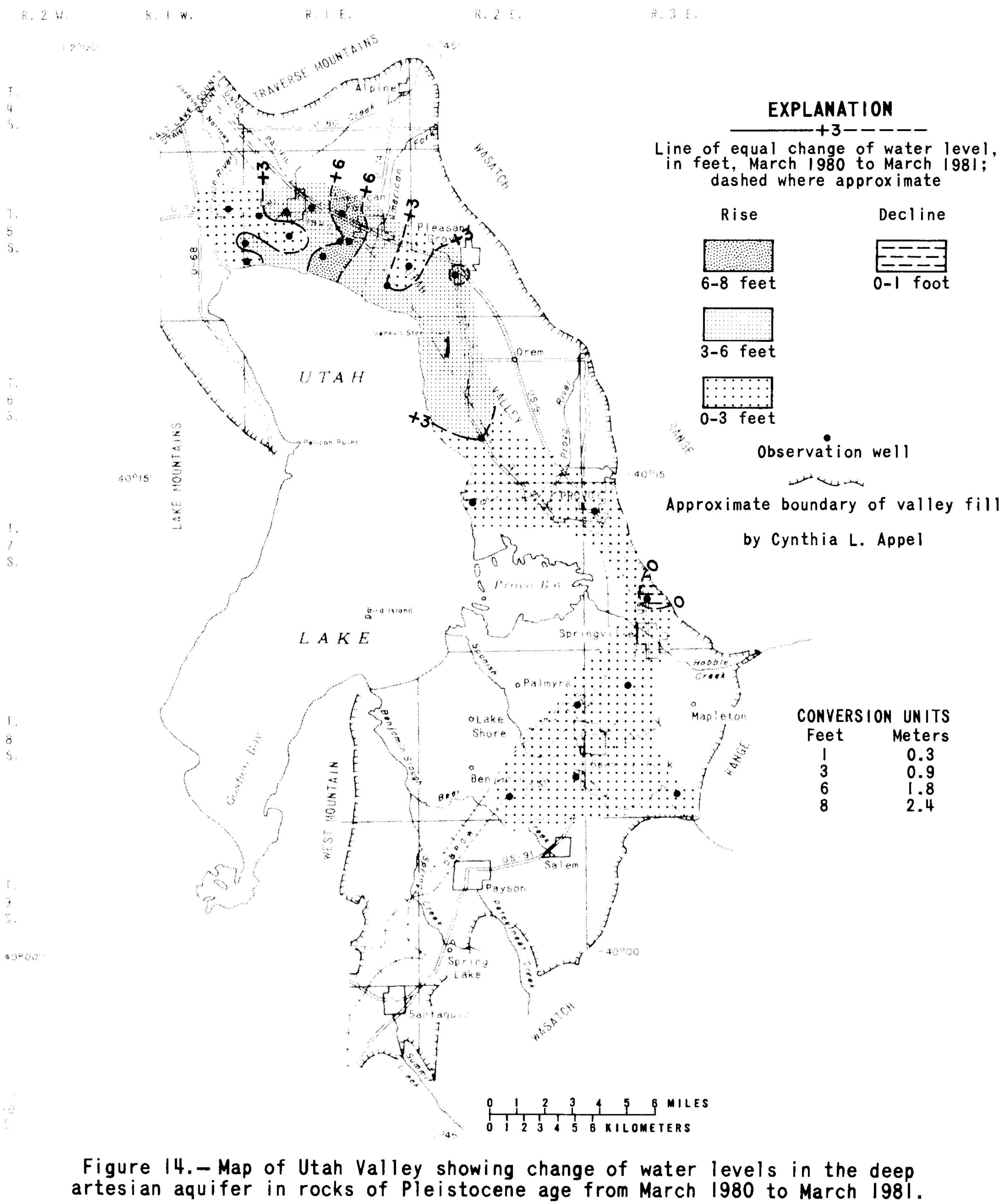


Figure 14.— Map of Utah Valley showing change of water levels in the deep artesian aquifer in rocks of Pleistocene age from March 1980 to March 1981.

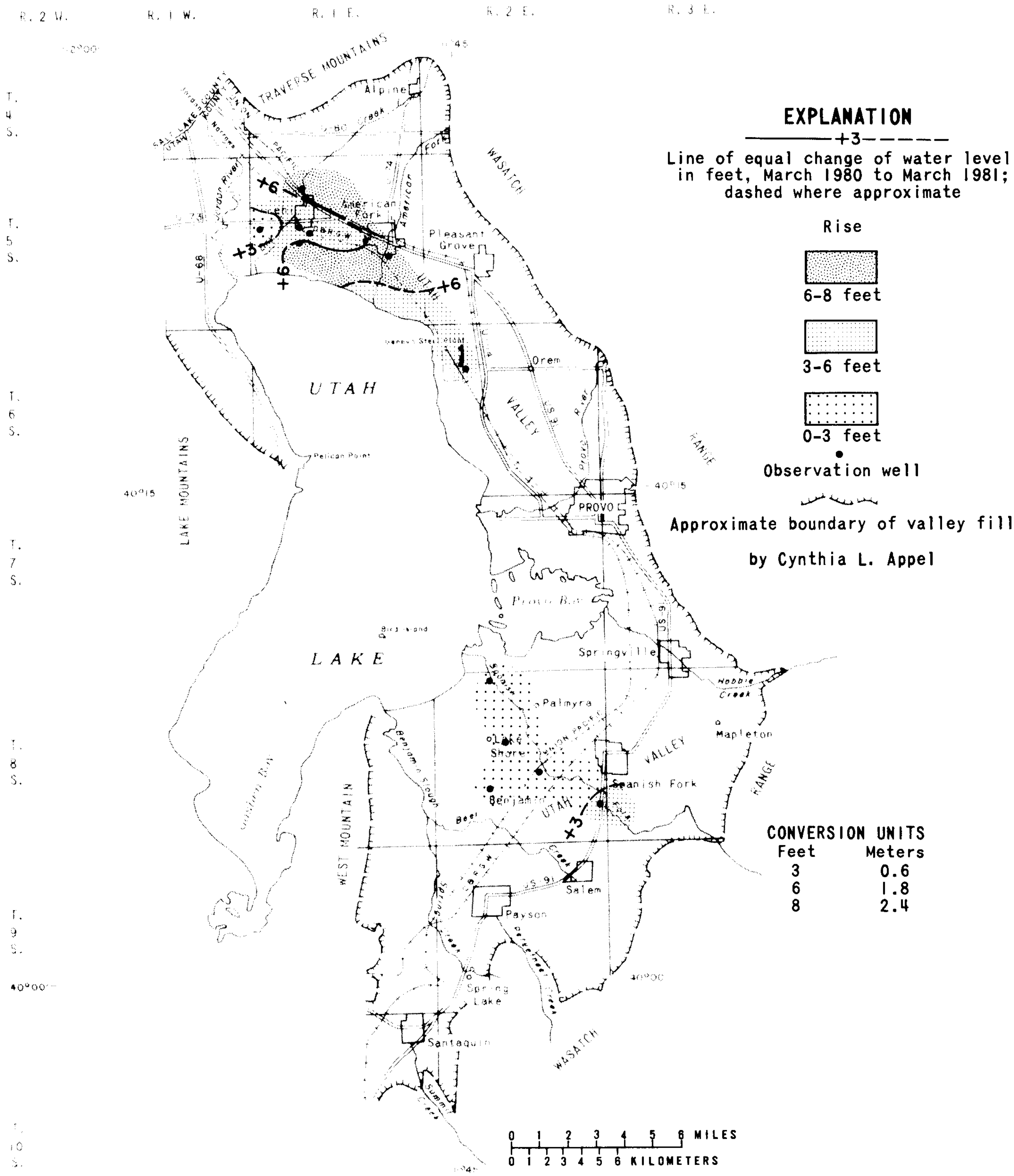


Figure 15.—Map of Utah Valley showing change of water levels in the artesian aquifer in rocks of Tertiary age from March 1980 to March 1981.

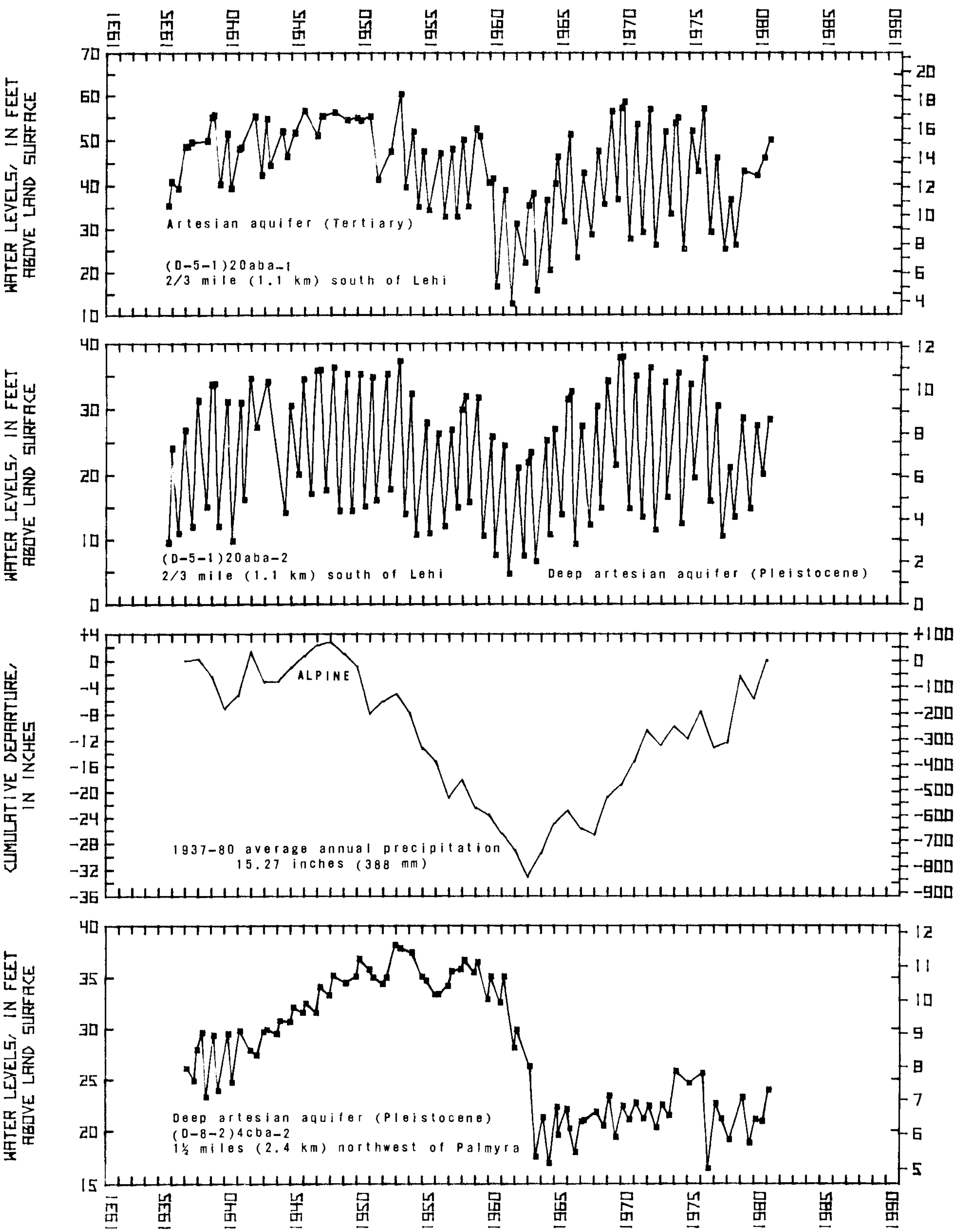


Figure 16.— Relation of water levels in selected wells to cumulative departure from the average annual precipitation at Alpine and Spanish Fork powerhouse and withdrawals from wells in Utah and Goshen Valleys.

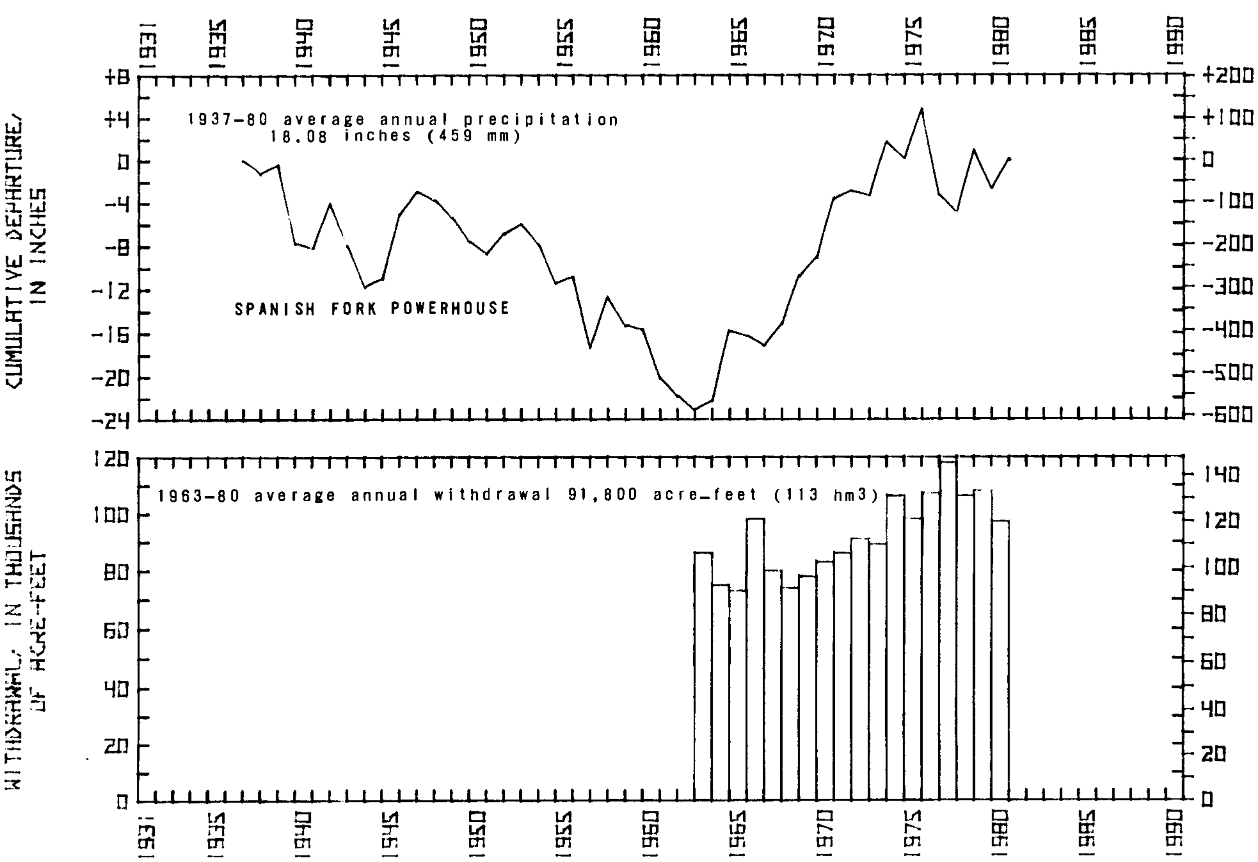
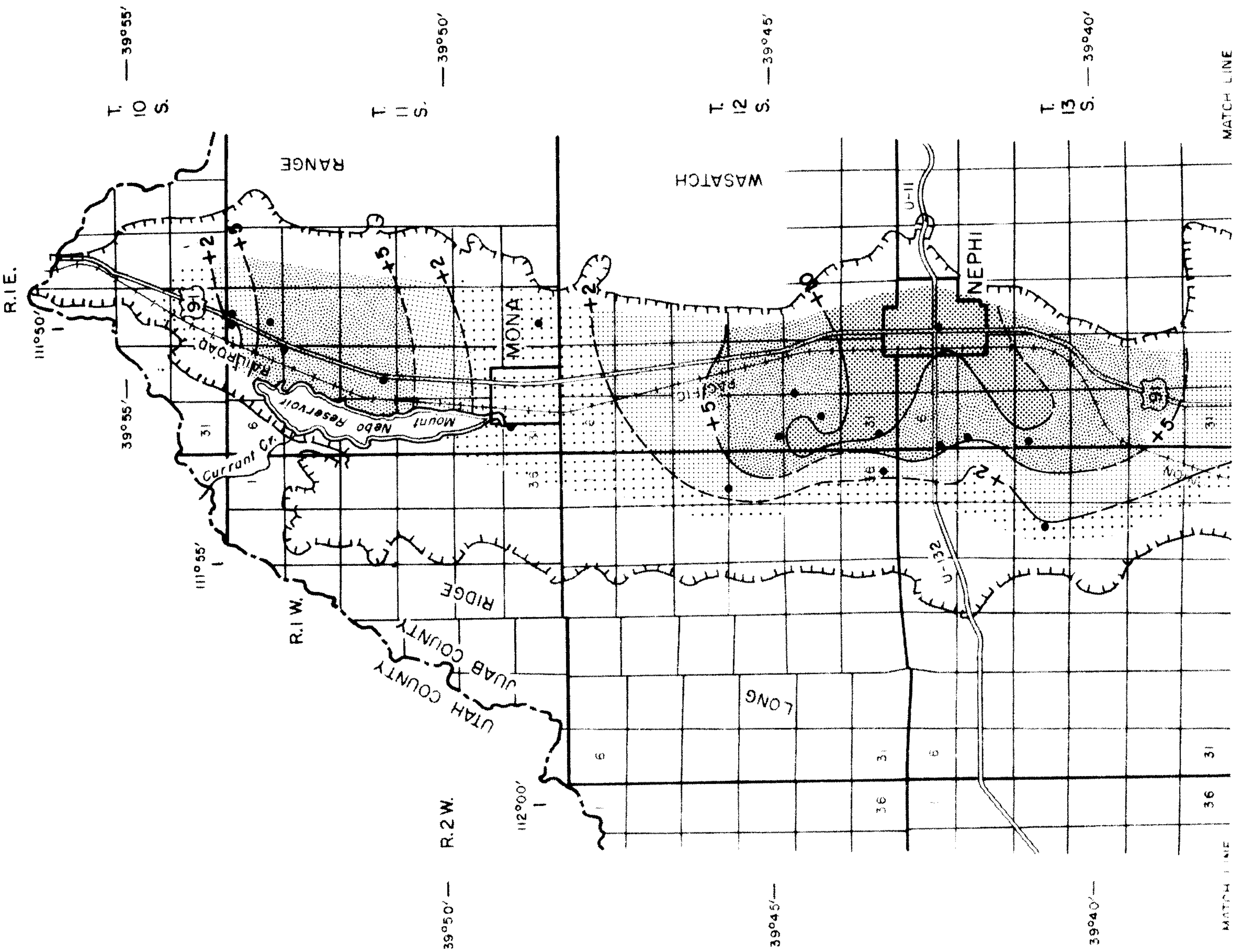


Figure 16.— Continued.



R.1 E.
R.1 W.
R.2 W.
T. 10 S.
T. 11 S.
T. 12 S.
T. 13 S.
39°55'
39°50'
39°45'
39°40'
111°50'
111°55'
112°00'
MATCH LINE
WASATCH
RANGE
LONG
RIDGE
MONA
NEPHI
Mount Nebo Reservoir
Currant Cr.
RAILROAD
PACIFIC
JUAB COUNTY
UTAH COUNTY
U-11
U-132
91
+2
+5

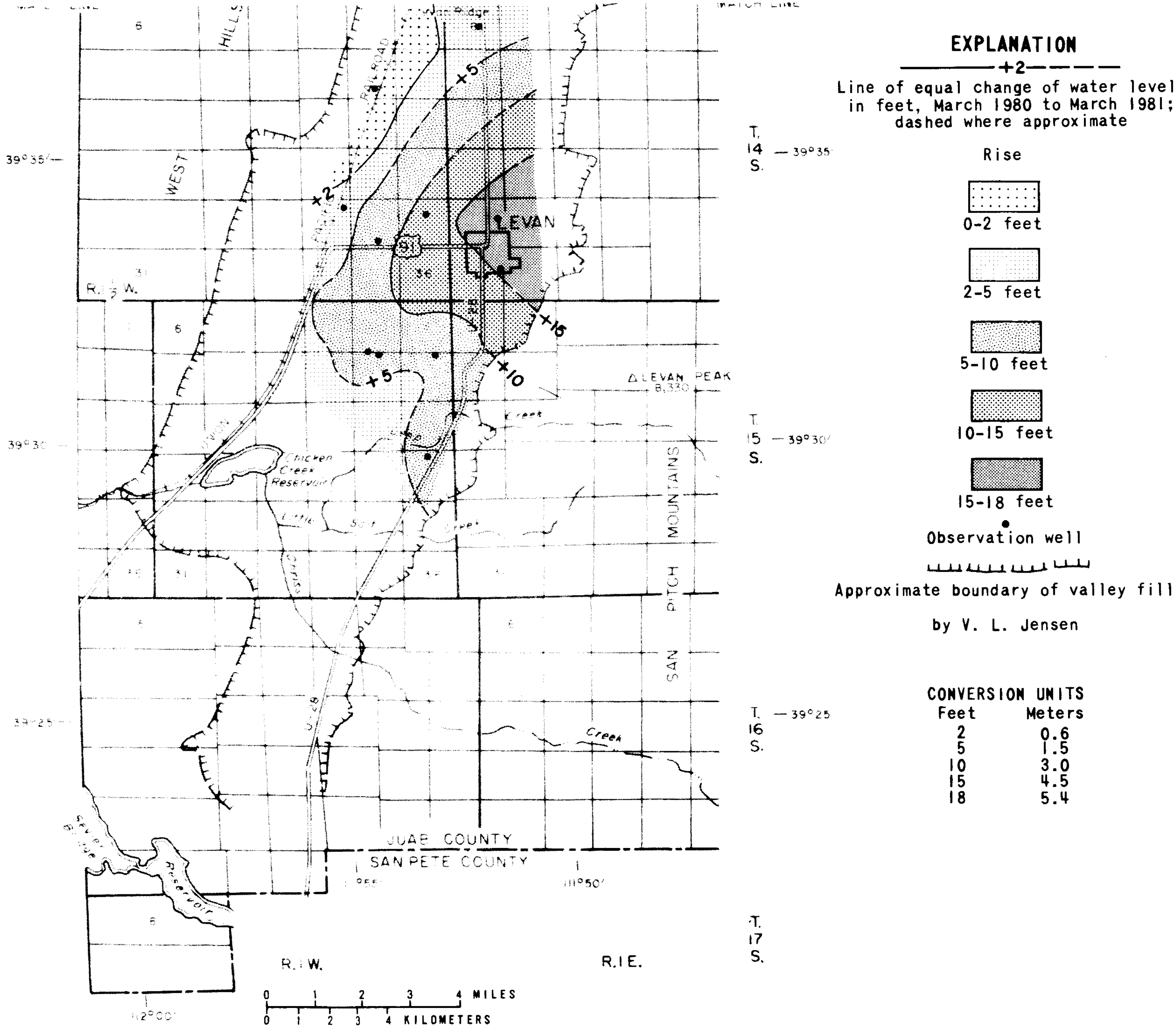


Figure 17.—Map of Juab Valley showing change of water levels from March 1980 to March 1981.

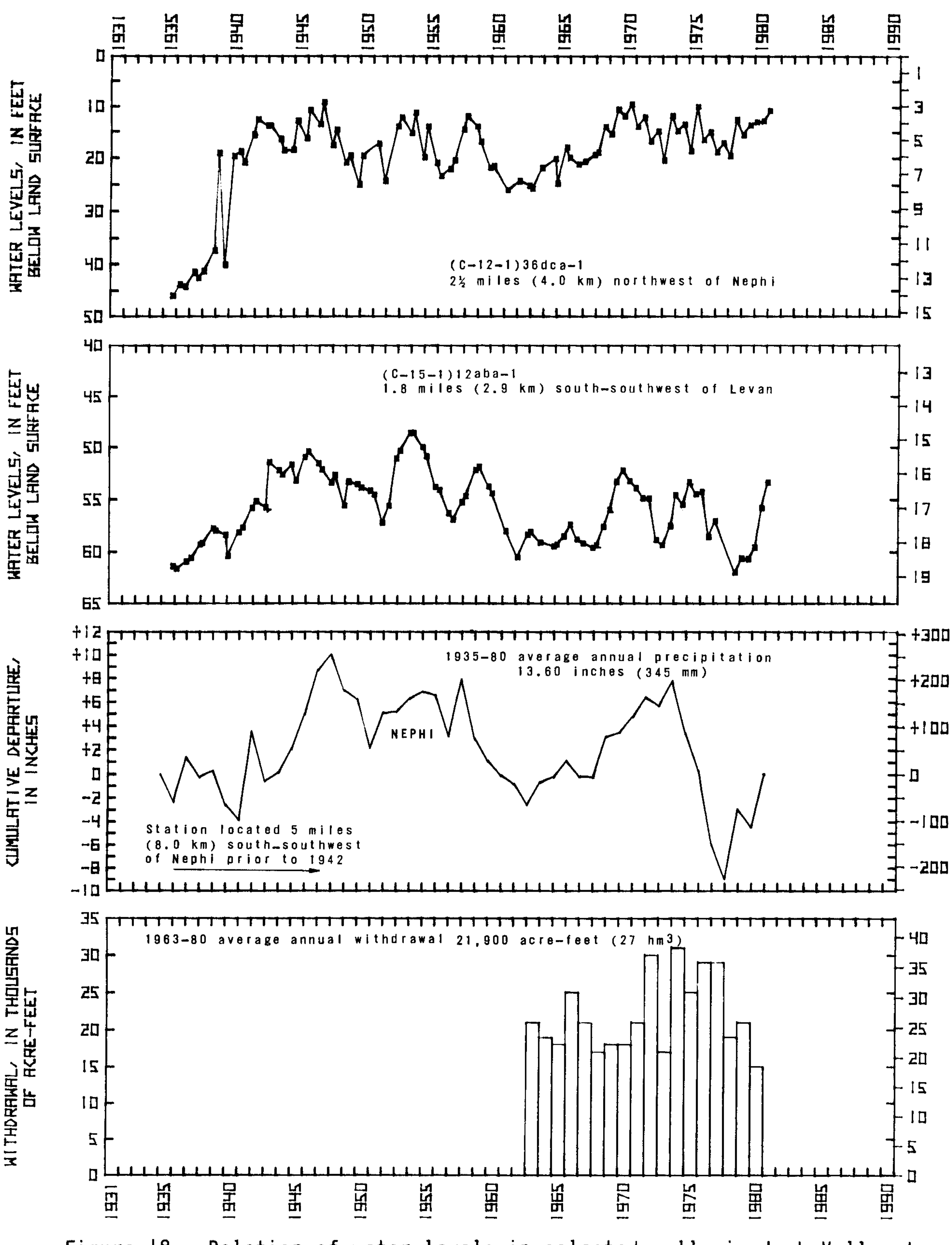


Figure 18.—Relation of water levels in selected wells in Juab Valley to cumulative departure from the average annual precipitation at Nephi and to annual withdrawals from wells.

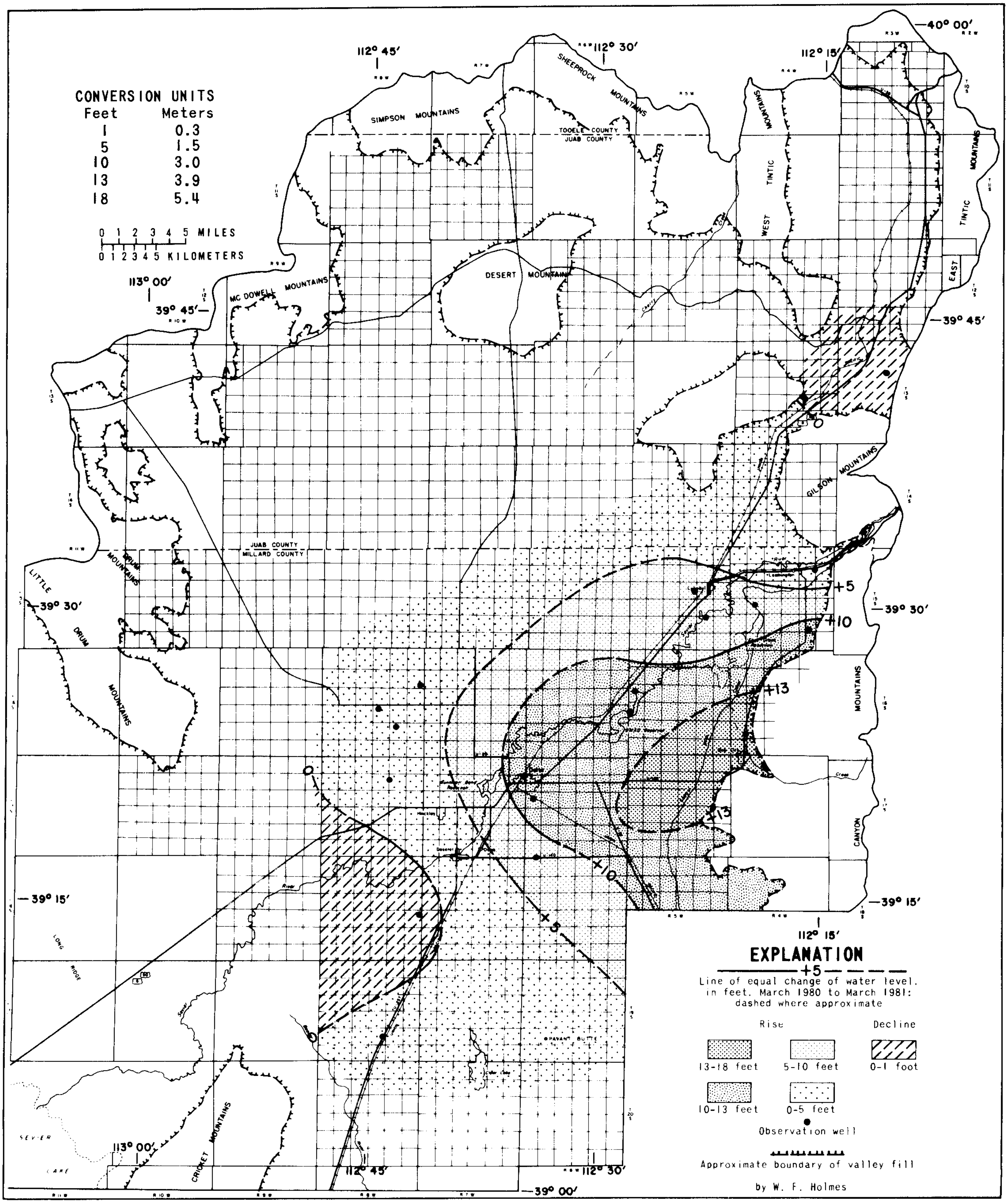


Figure 19.—Map of part of the Sevier Desert showing change of water levels in the lower artesian aquifer from March 1980 to March 1981.

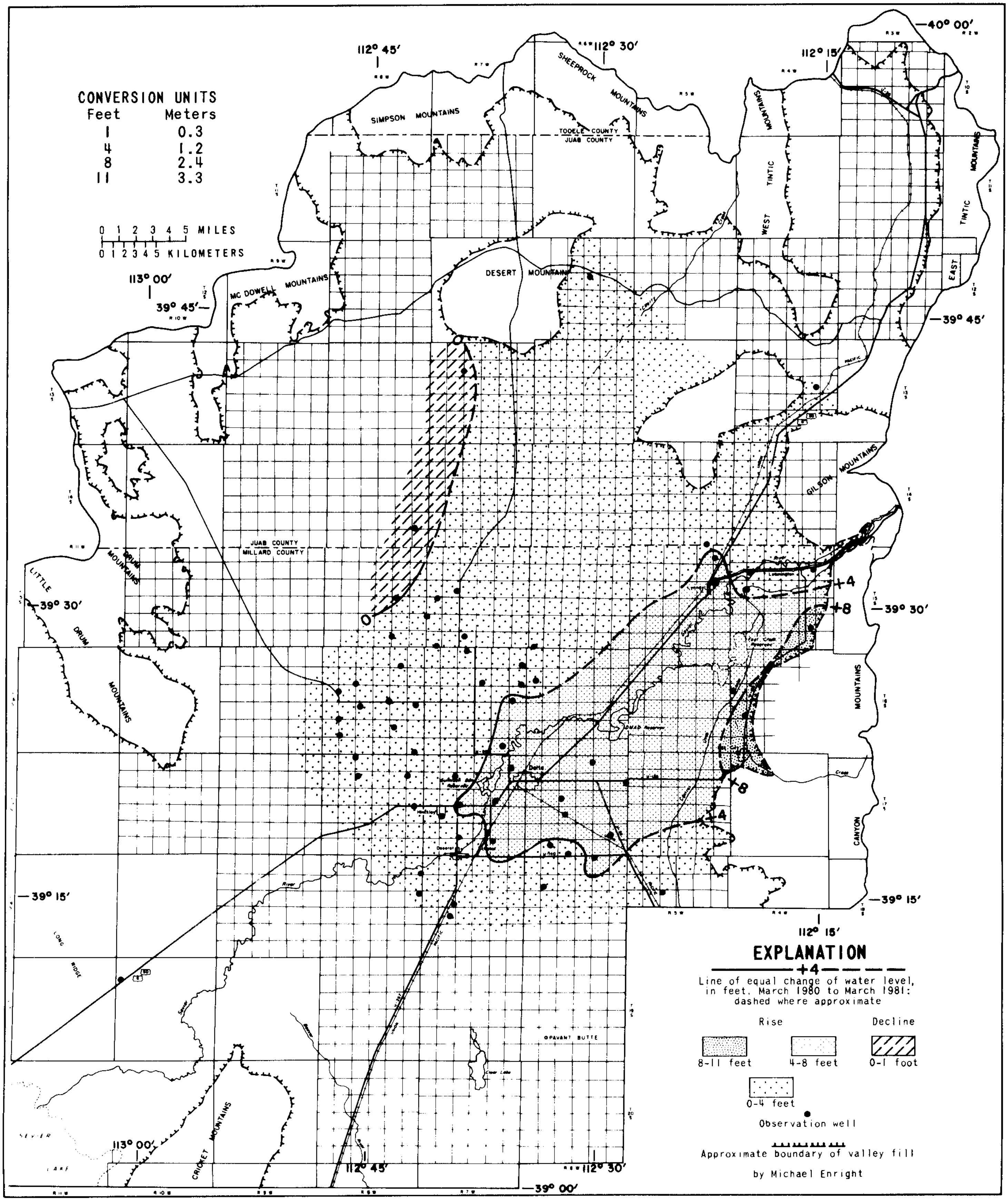


Figure 20.—Map of part of the Sevier Desert showing change of water levels in the upper artesian aquifer from March 1980 to March 1981.

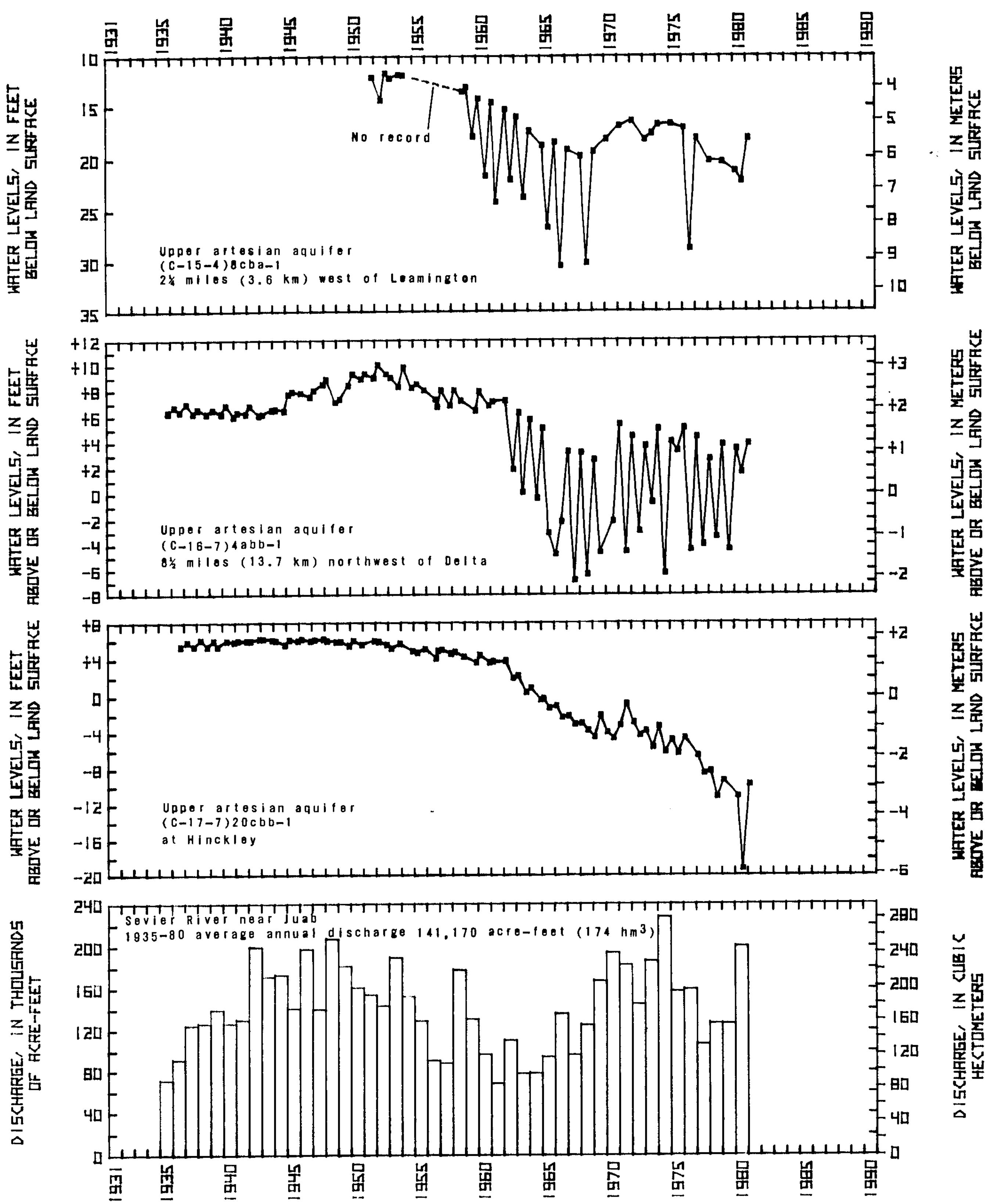
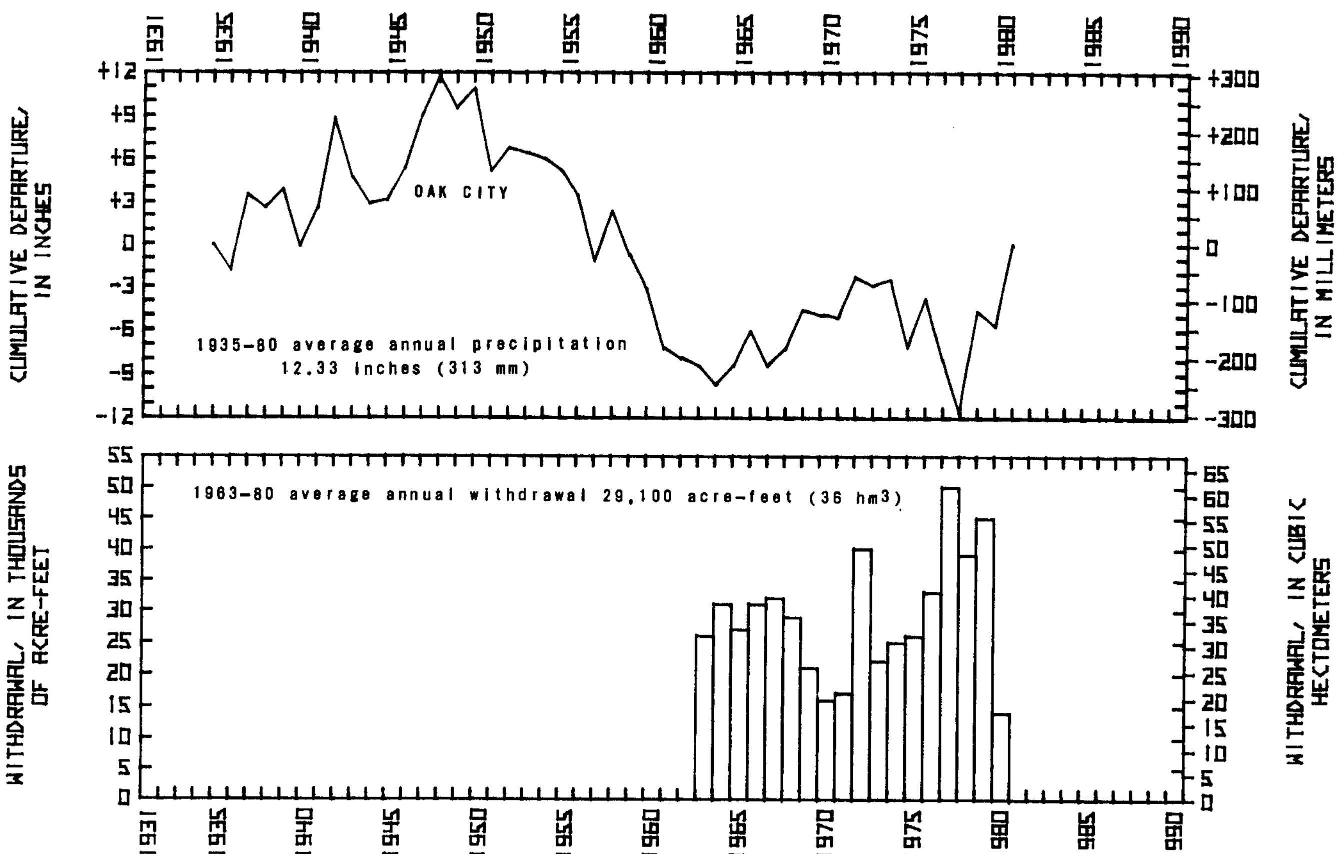


Figure 21.—Relation of water levels in selected wells in the Sevier Desert to discharge of the Sevier River near Juab, to cumulative departure from the average annual precipitation at Oak City, and to annual withdrawals from wells.



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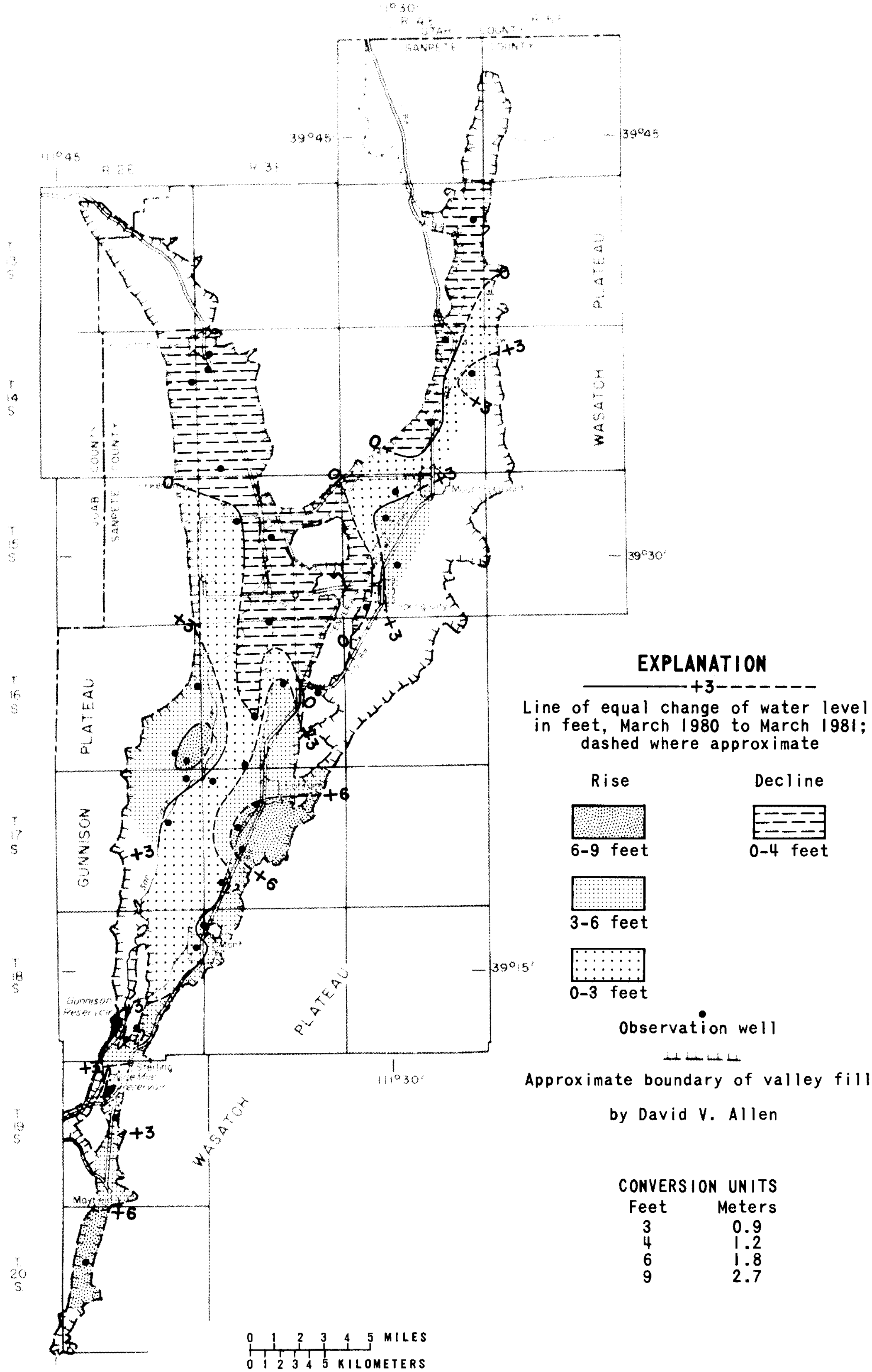


Figure 22.—Map of Sanpete Valley showing change of water levels from March 1980 to March 1981.

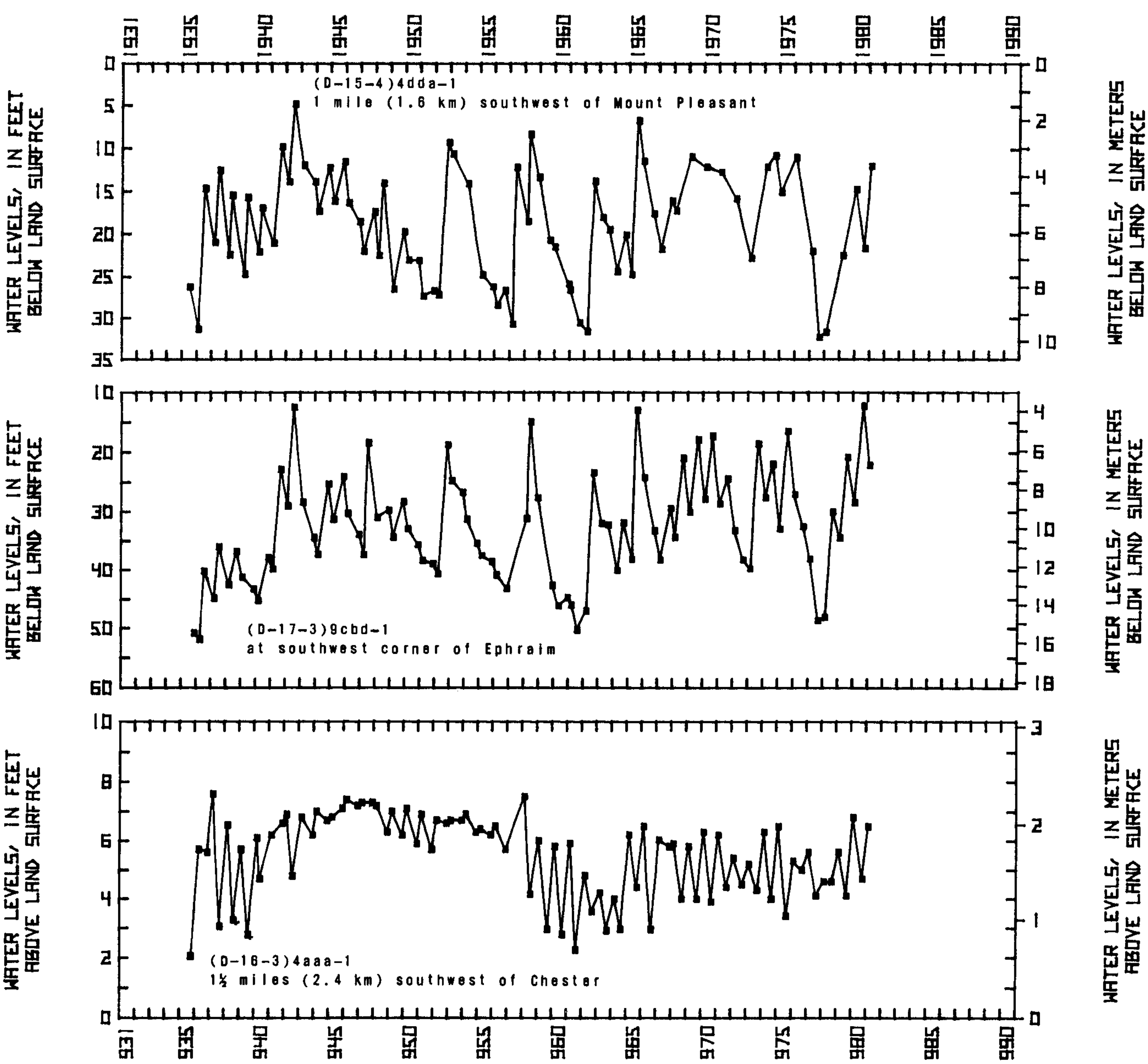


Figure 23.—Relation of water levels in selected wells in Sanpete Valley to cumulative departure from the average annual precipitation at Manti and to annual withdrawals from wells.

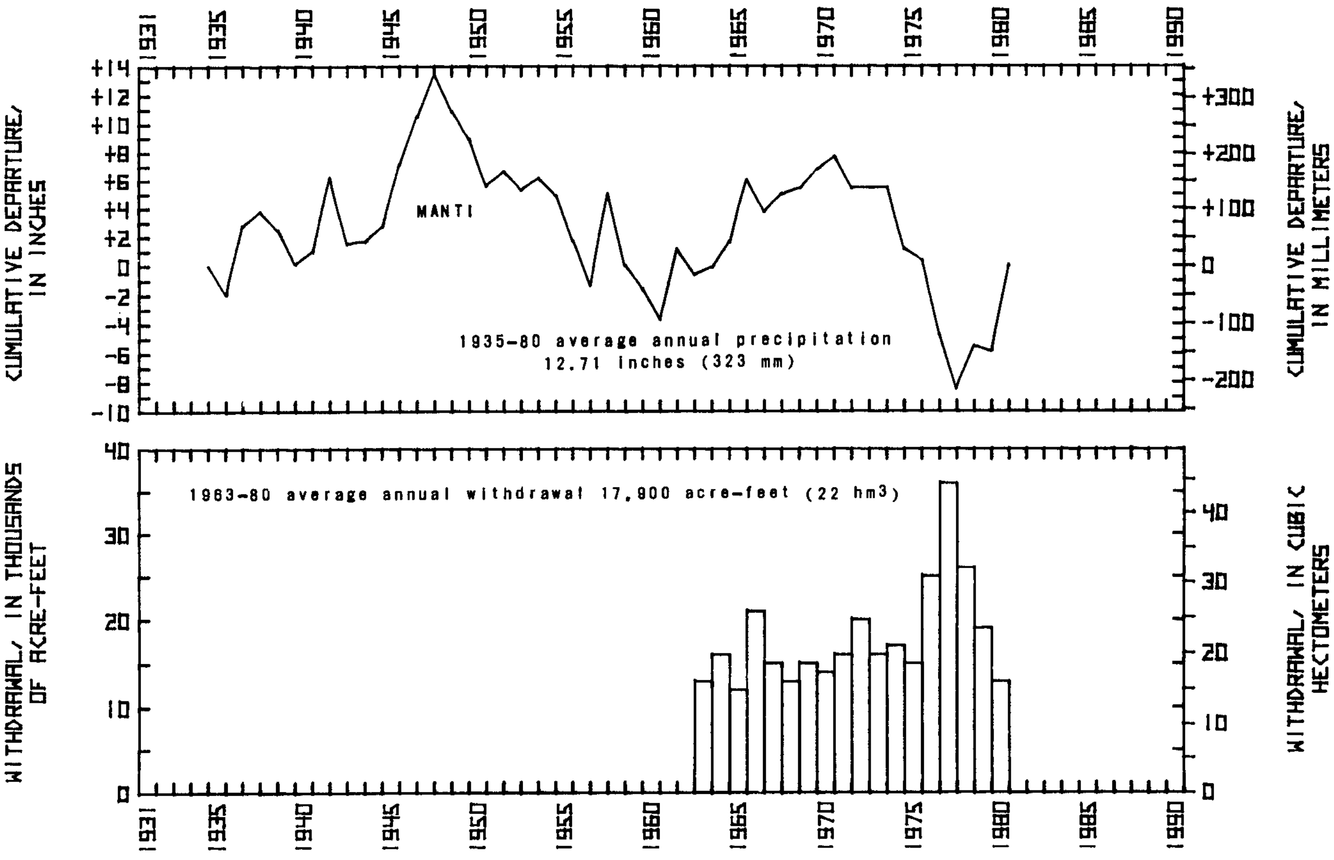
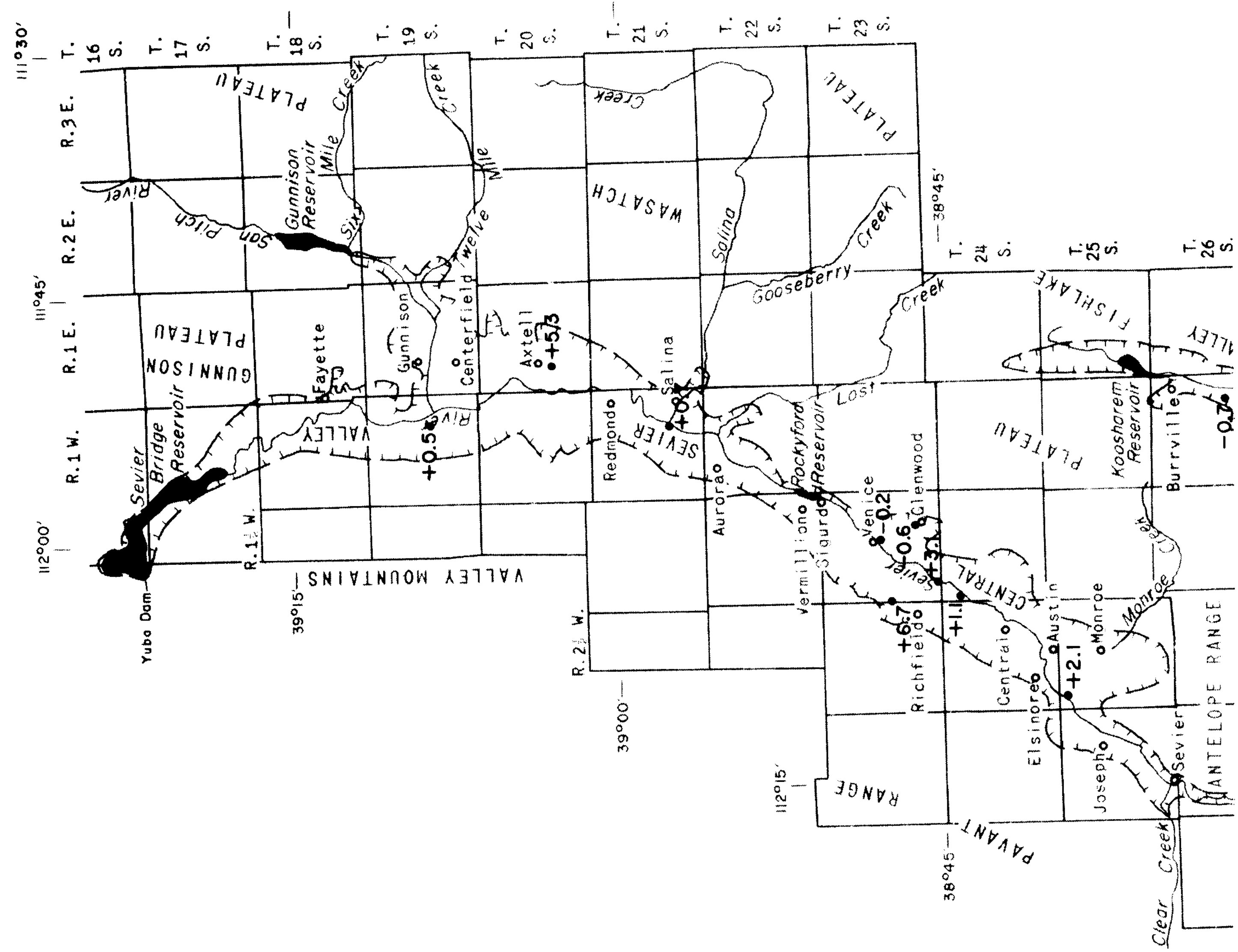


Figure 23.— Continued.



Yuba Dam
Sevier Bridge Reservoir
Gunnison Reservoir
San Pitch River
Six Mile Creek
Twelve Mile Creek
Creek
GUNNISON PLATEAU
PLATEAU
WASATCH
PLATEAU
VALLEY
VALLEY MOUNTAINS
SEVIER
Fayette
Gunnison
Centerfield
Axtell
+5.3
+0.5
Redmond
Salina
Salina
Gooseberry Creek
Lost Creek
Rockyford Reservoir
Aurora
Vermillion
Sigurd
Venice
-0.2
-0.6
Glenwood
+3.0
Sevier
CENTRAL
+6.7
Richfield
+1.1
Central
Elsinore
Austin
+2.1
Monroe
Monroe Creek
Joseph
Sevier
Clear Creek
ANTELOPE RANGE
PAVANT RANGE
FISHLAKE
PLATEAU
Koosharem Reservoir
Burrville
-0.7
112°00′
111°45′
111°30′
112°15′
39°15′
39°00′
38°45′
R.1 W.
R.1 E.
R.2 E.
R.3 E.
R.1½ W.
R.2½ W.
T. 16 S.
T. 17 S.
T. 18 S.
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T. 26 S.

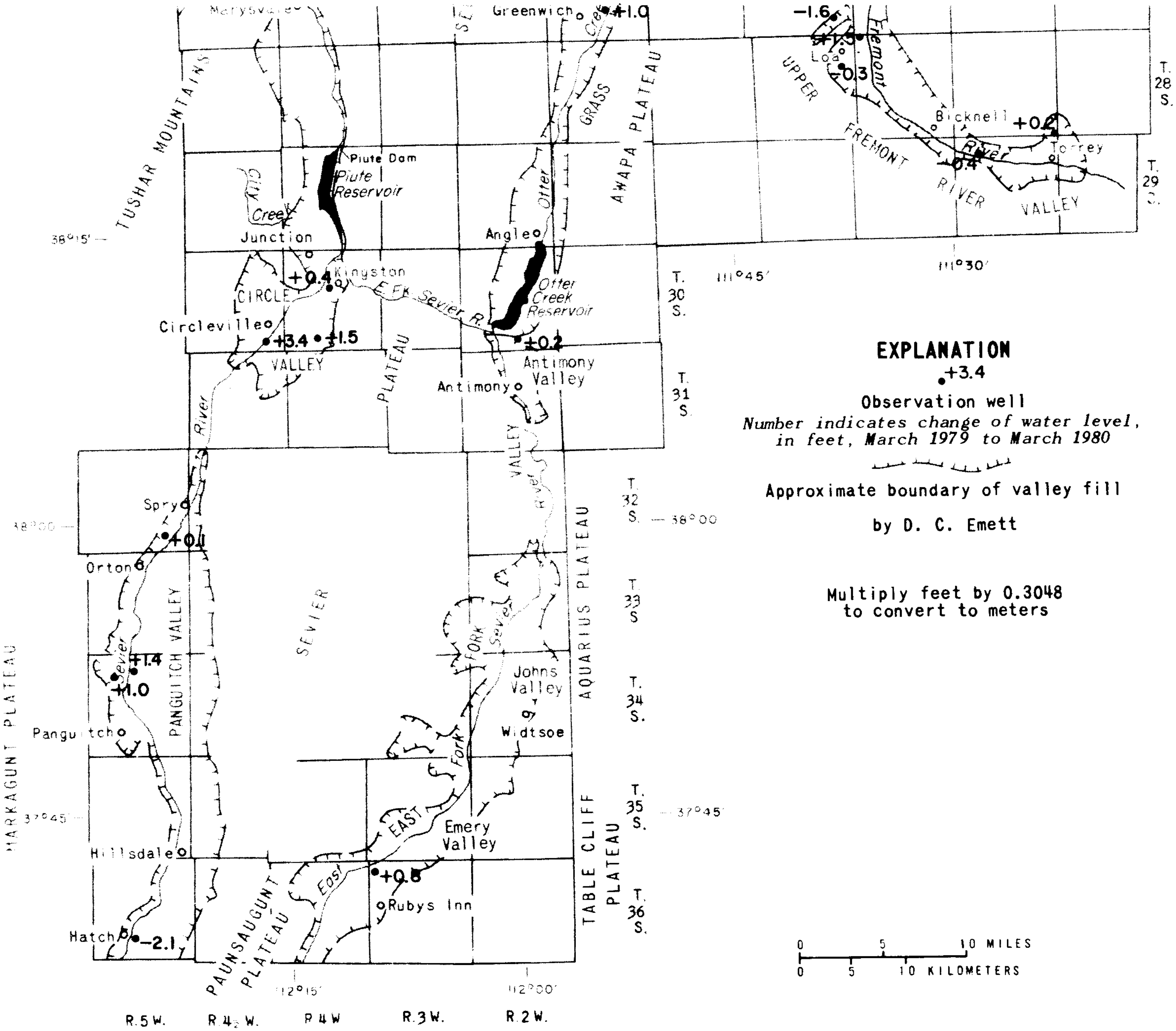


Figure 24.—Map of the upper and central Sevier Valleys and upper Fremont River valley showing change of water levels from March 1980 to March 1981.

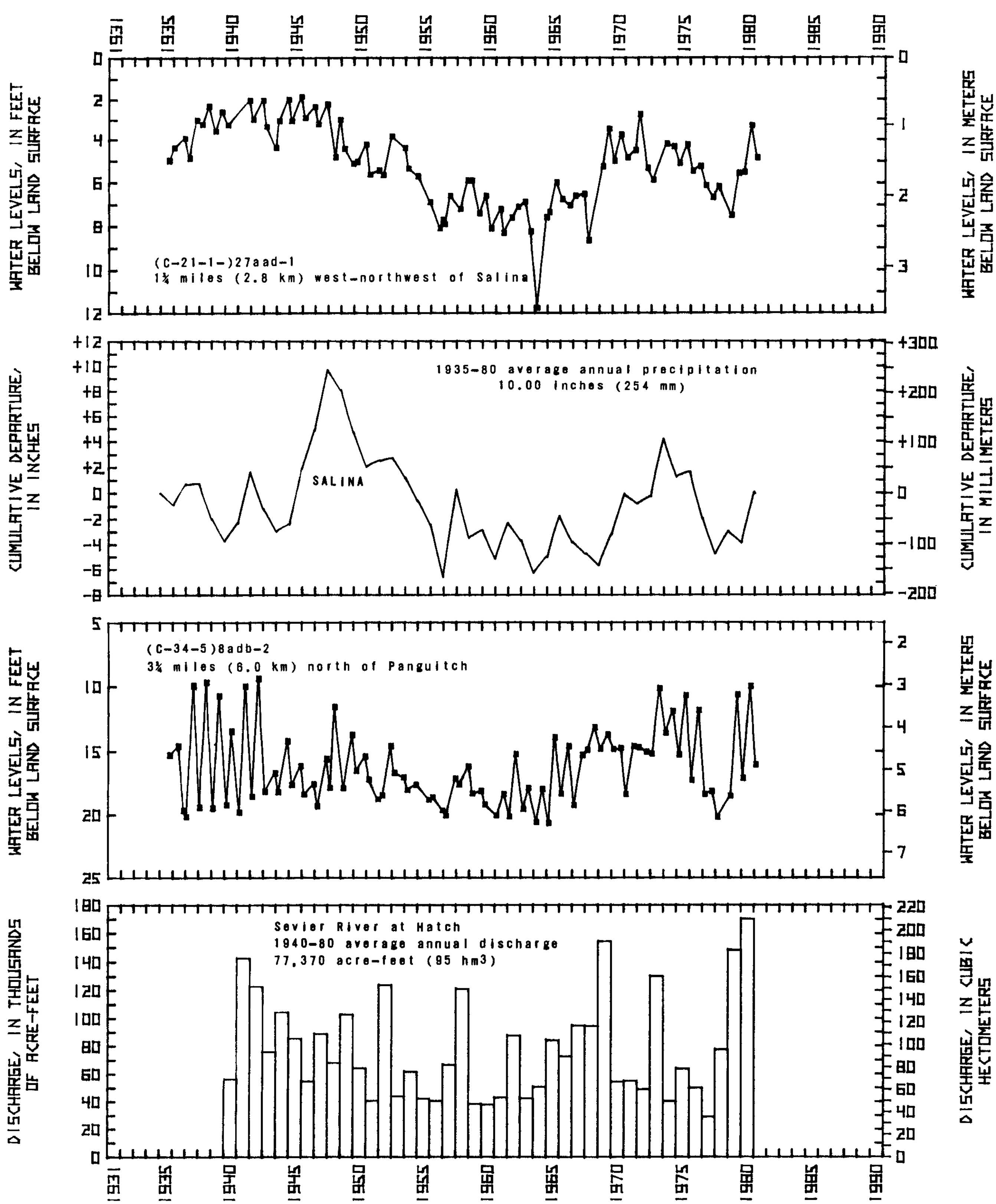


Figure 25.— Relation of water levels in selected wells to discharge of the Sevier River at Hatch, to cumulative departure from average annual precipitation at selected climate stations, and to annual withdrawals from wells - upper and central Sevier Valleys and upper Fremont River valley.

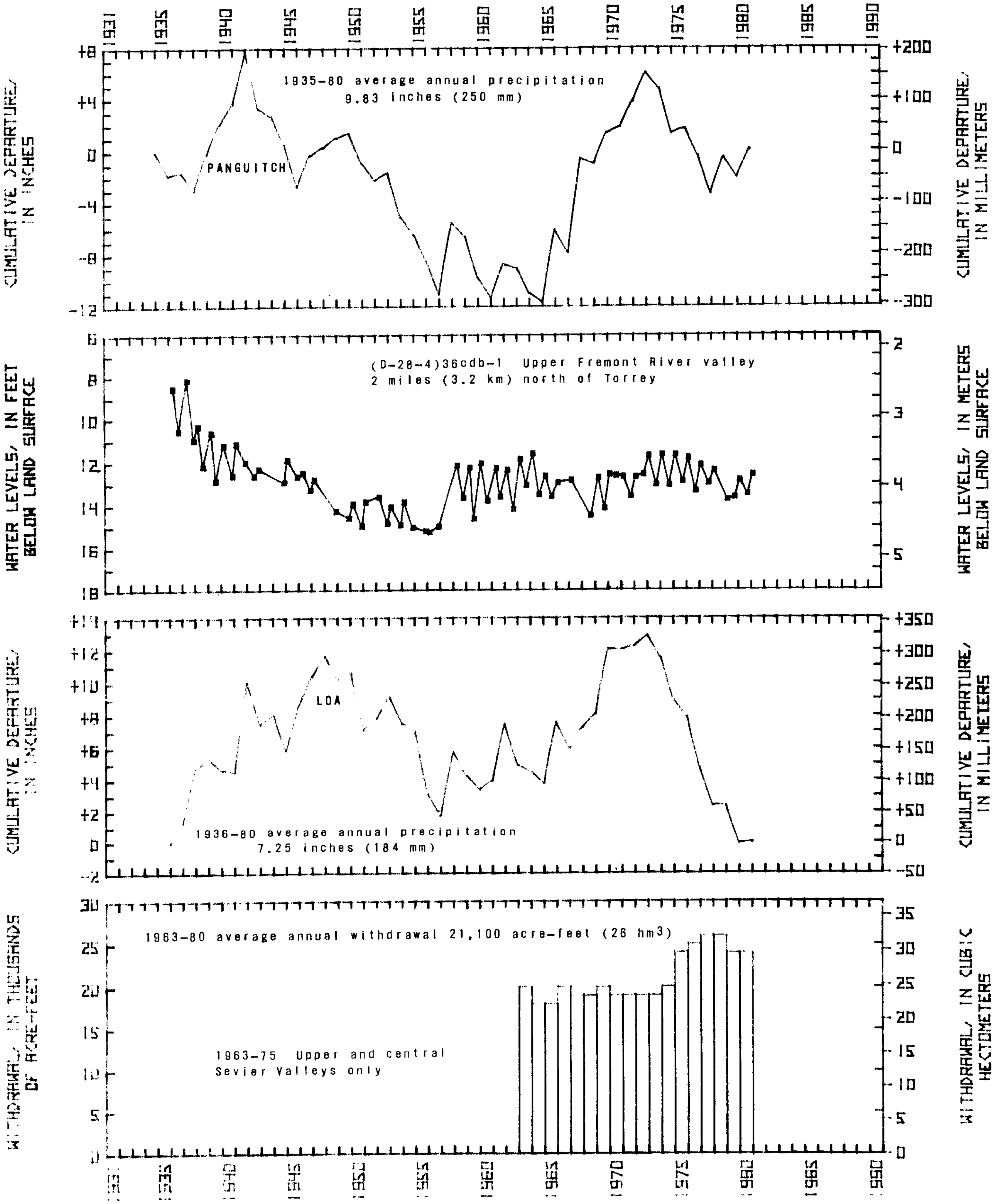


Figure 25.— Continued.

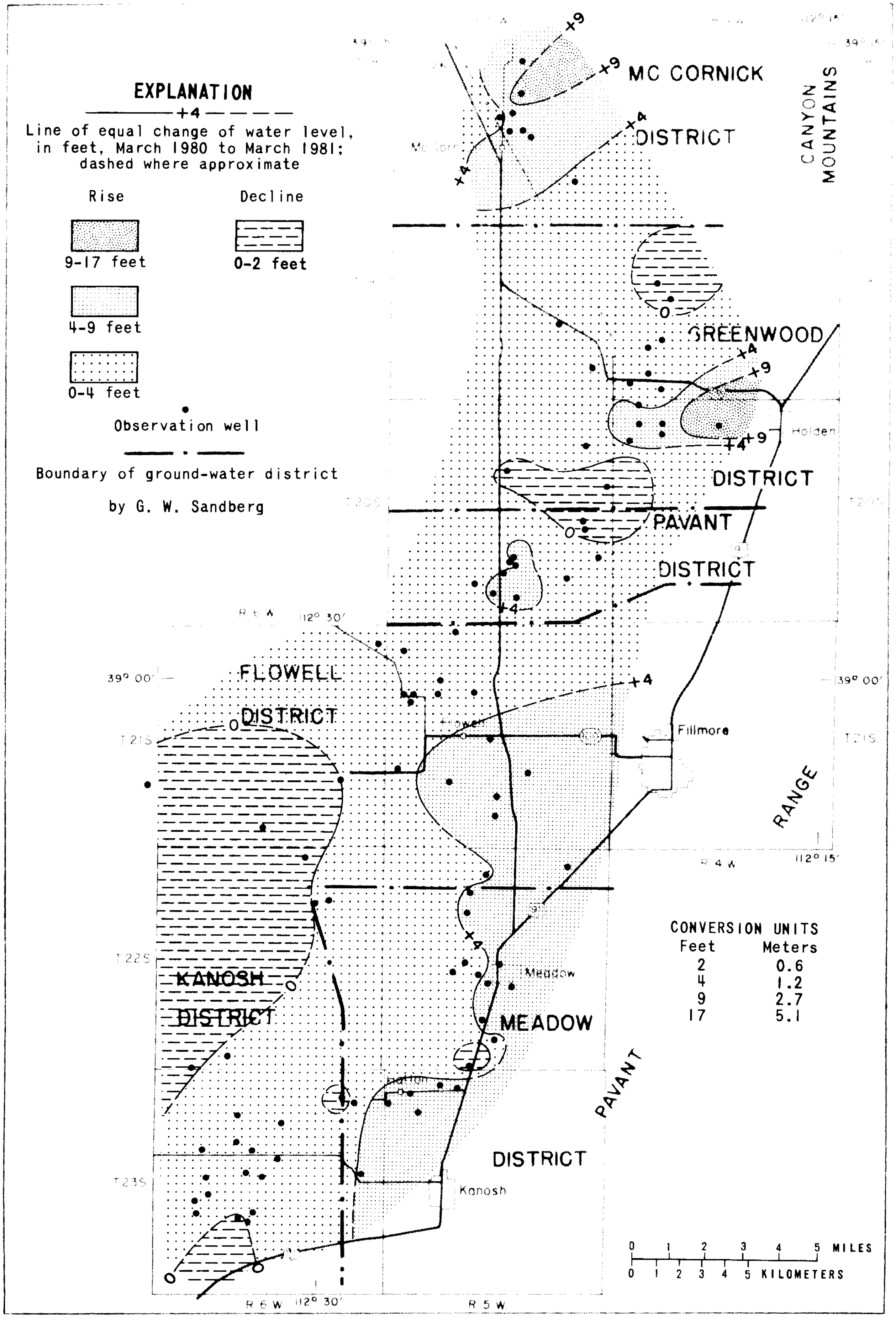


Figure 26.—Map of Pavant Valley showing change of water levels from March 1980 to March 1981.

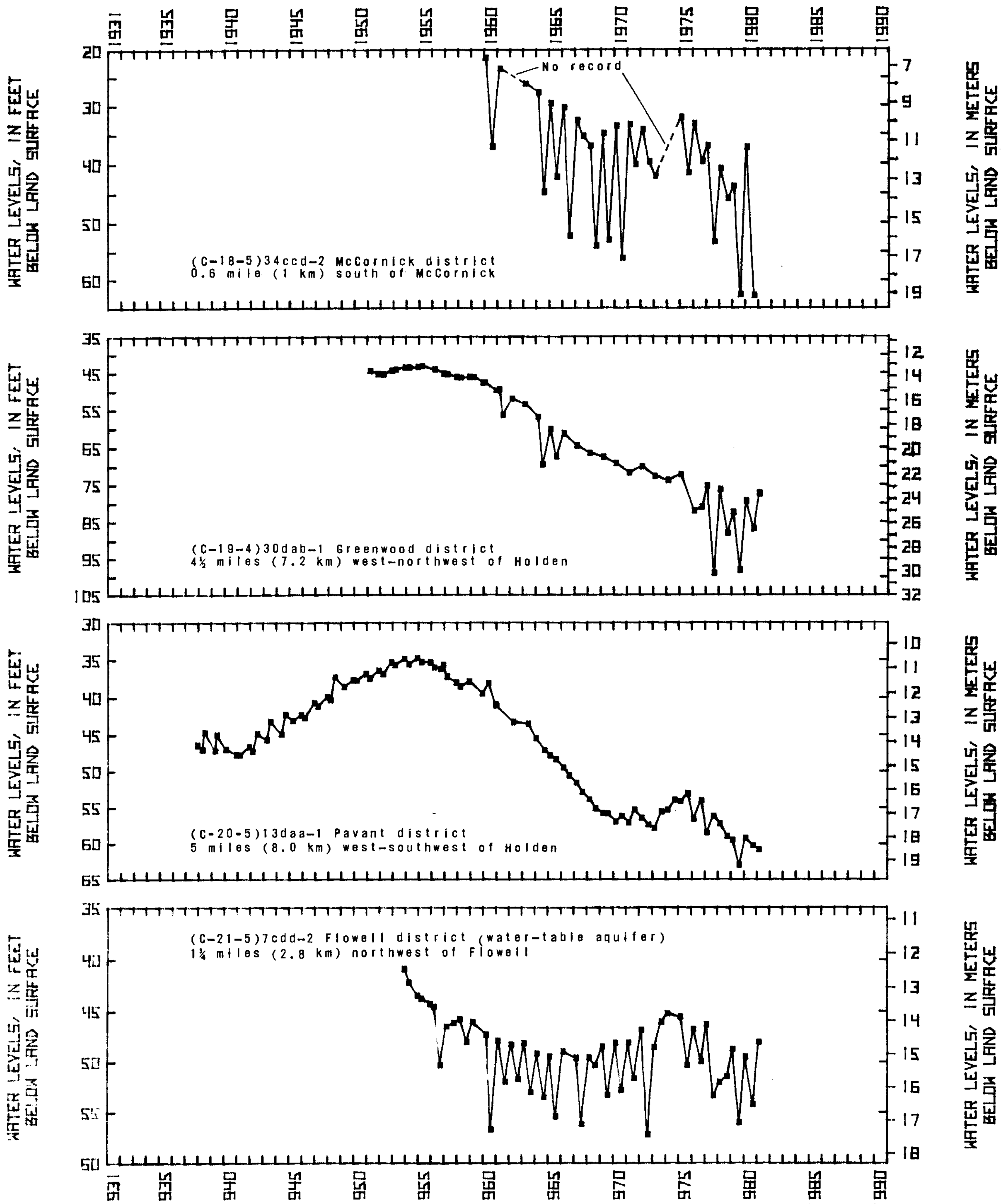


Figure 27.—Relation of water levels in selected wells in Pavant Valley to cumulative departure from the average annual precipitation at Fillmore and to annual withdrawals from wells.

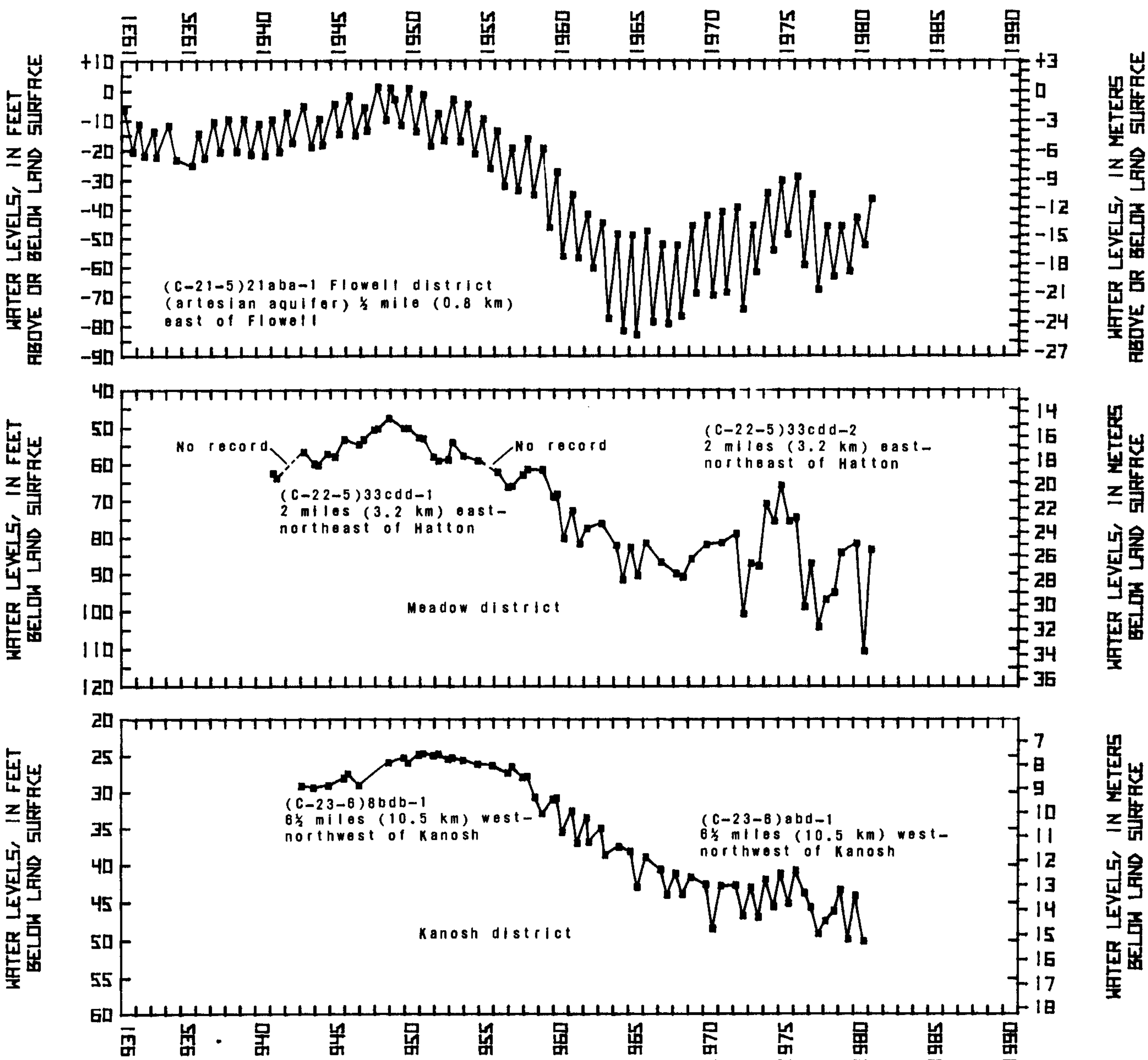
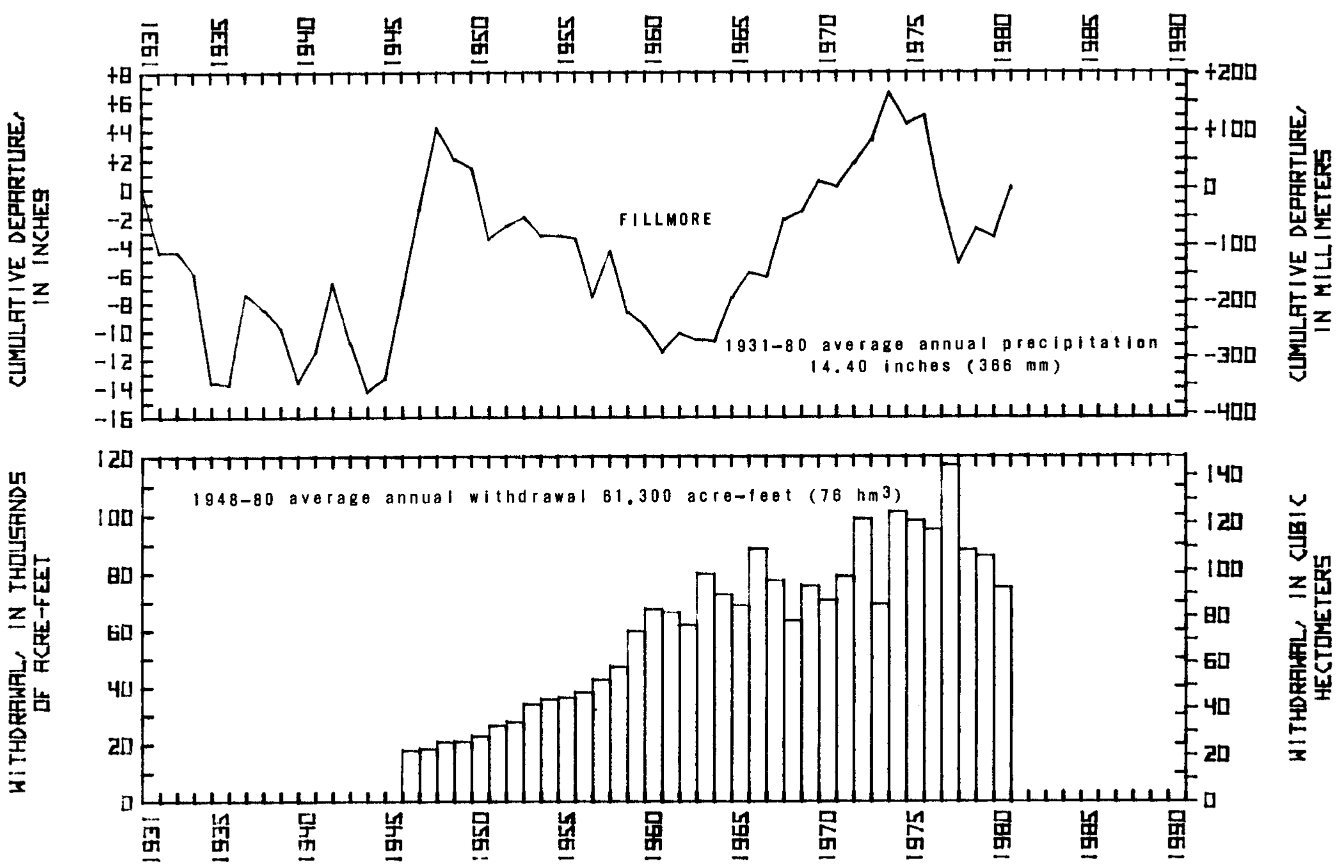


Figure 27.— Continued.



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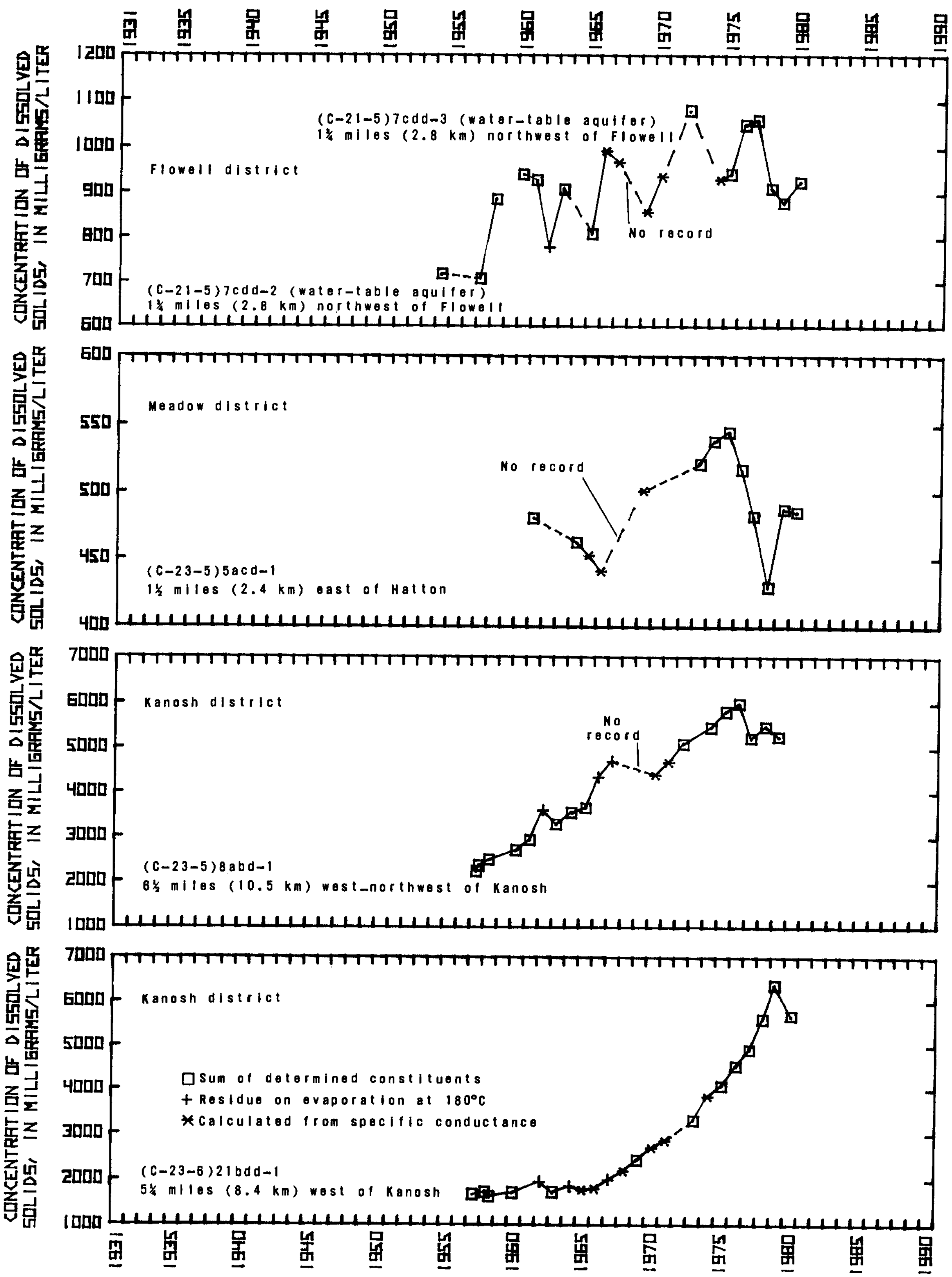

Figure 28.— Concentration of dissolved solids in water from selected wells in Pavant Valley.

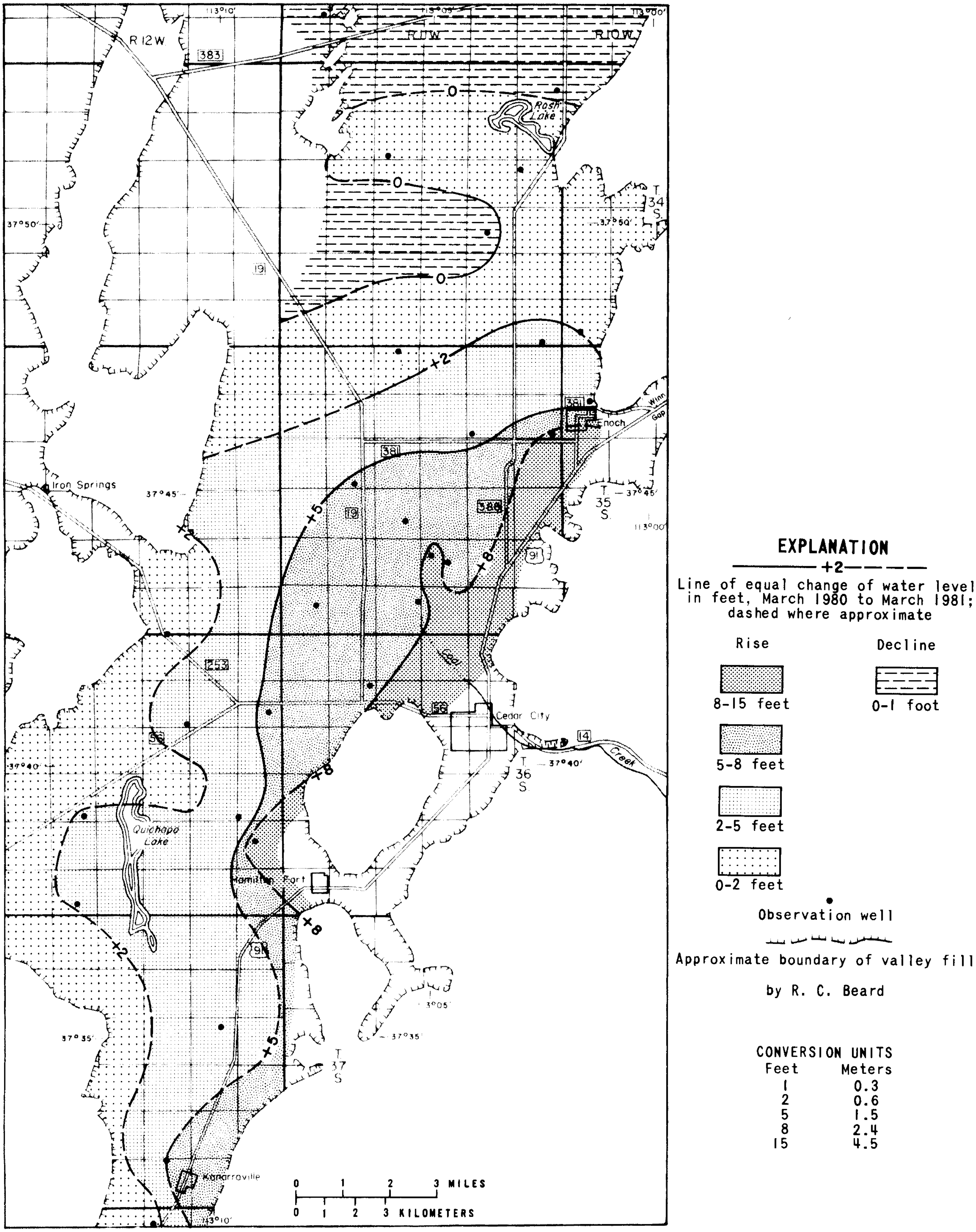

Figure 29.—Map of Cedar City Valley showing change of water levels from March 1980 to March 1981.

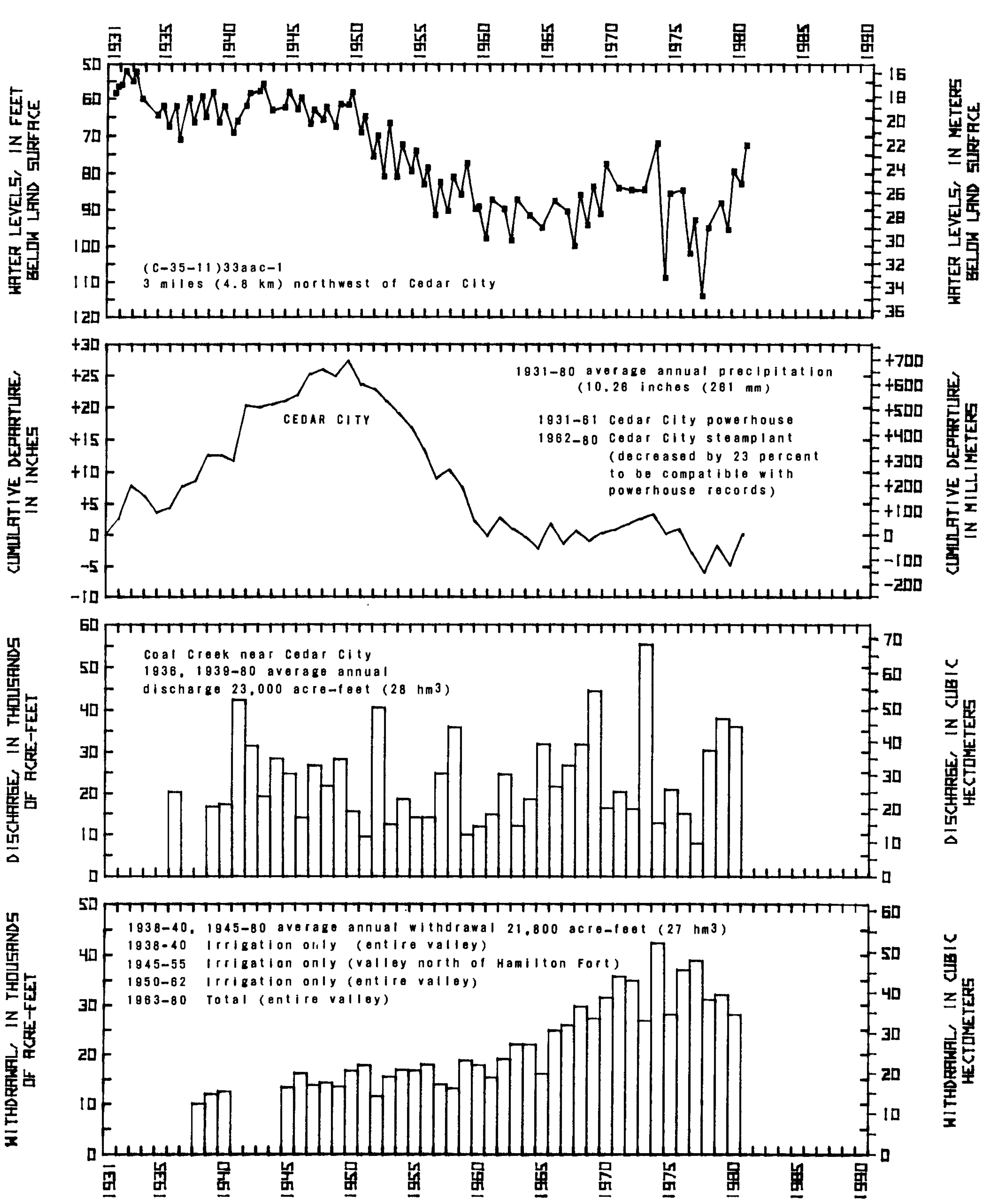

Figure 30.—Relation of water levels in well (C-35-11)33aac-1 in Cedar City Valley to cumulative departure from the average annual precipitation at the Cedar City powerhouse, to discharge of Coal Creek near Cedar City, and to annual withdrawals from wells.

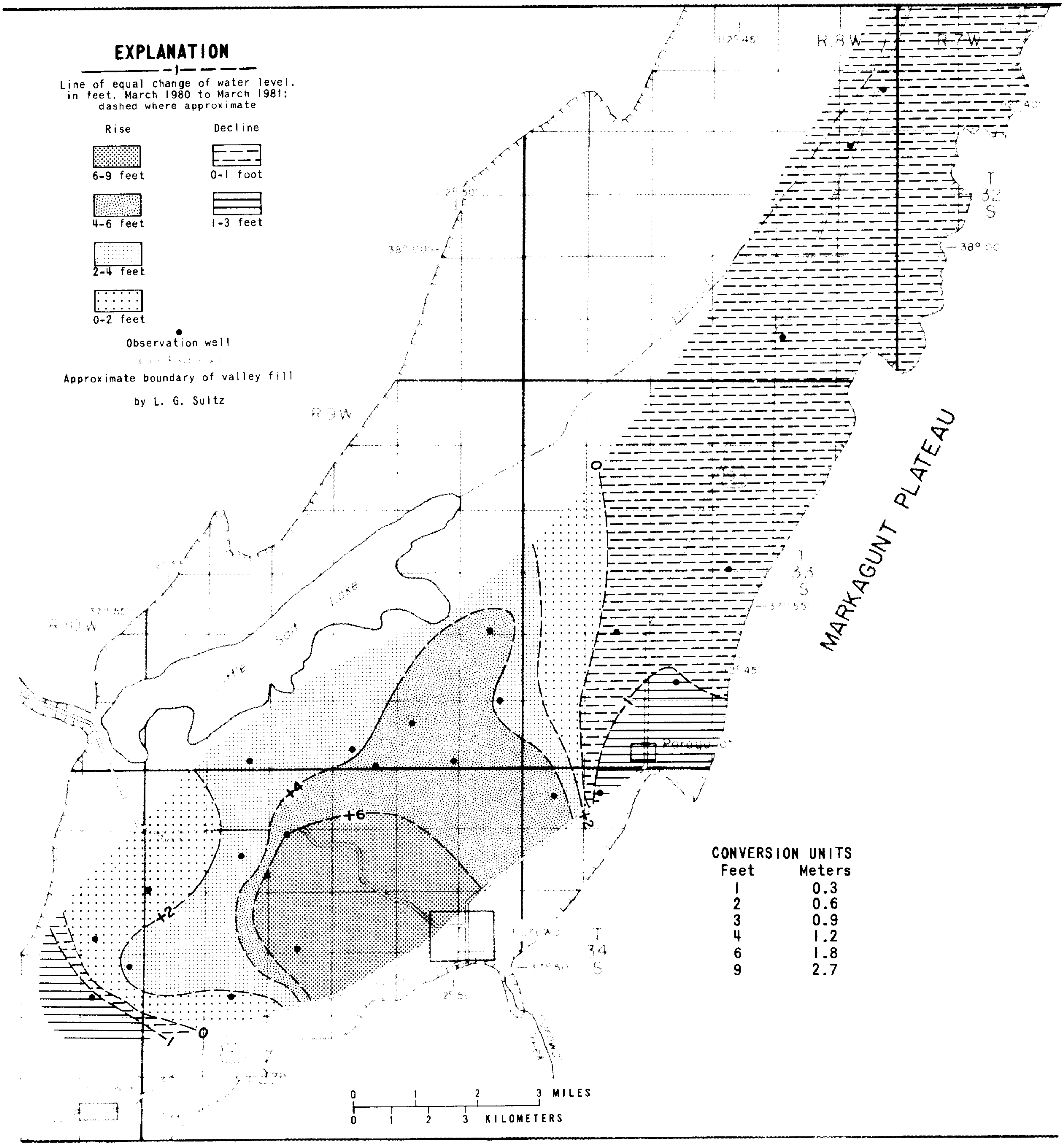

Figure 31.—Map of Parowan Valley showing change of water levels from March 1980 to March 1981.

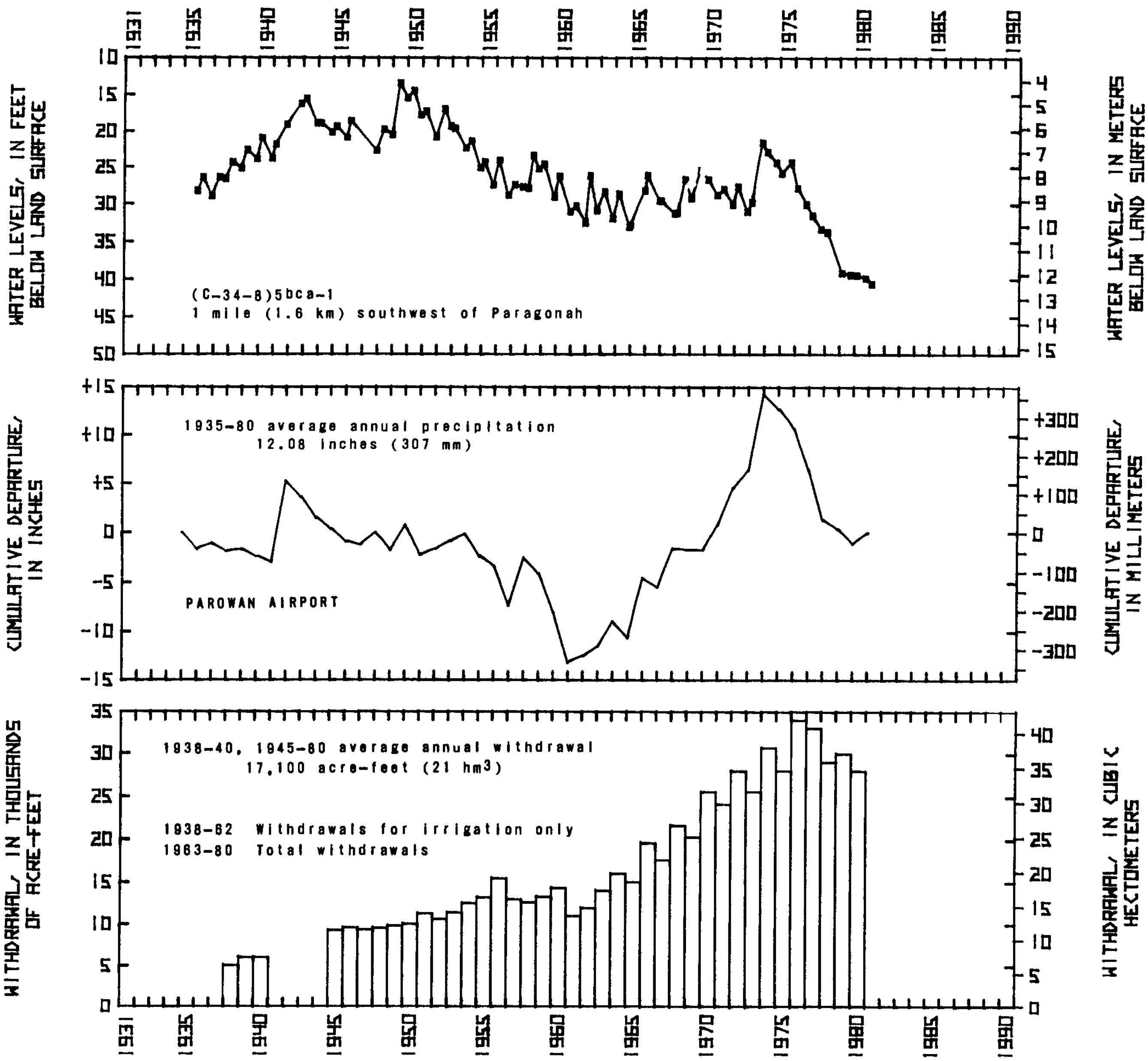

Figure 32.—Relation of water levels in well (C-34-8)5bca-1 in Parowan Valley to cumulative departure from the average annual precipitation at Parowan Airport and to annual withdrawals from wells.

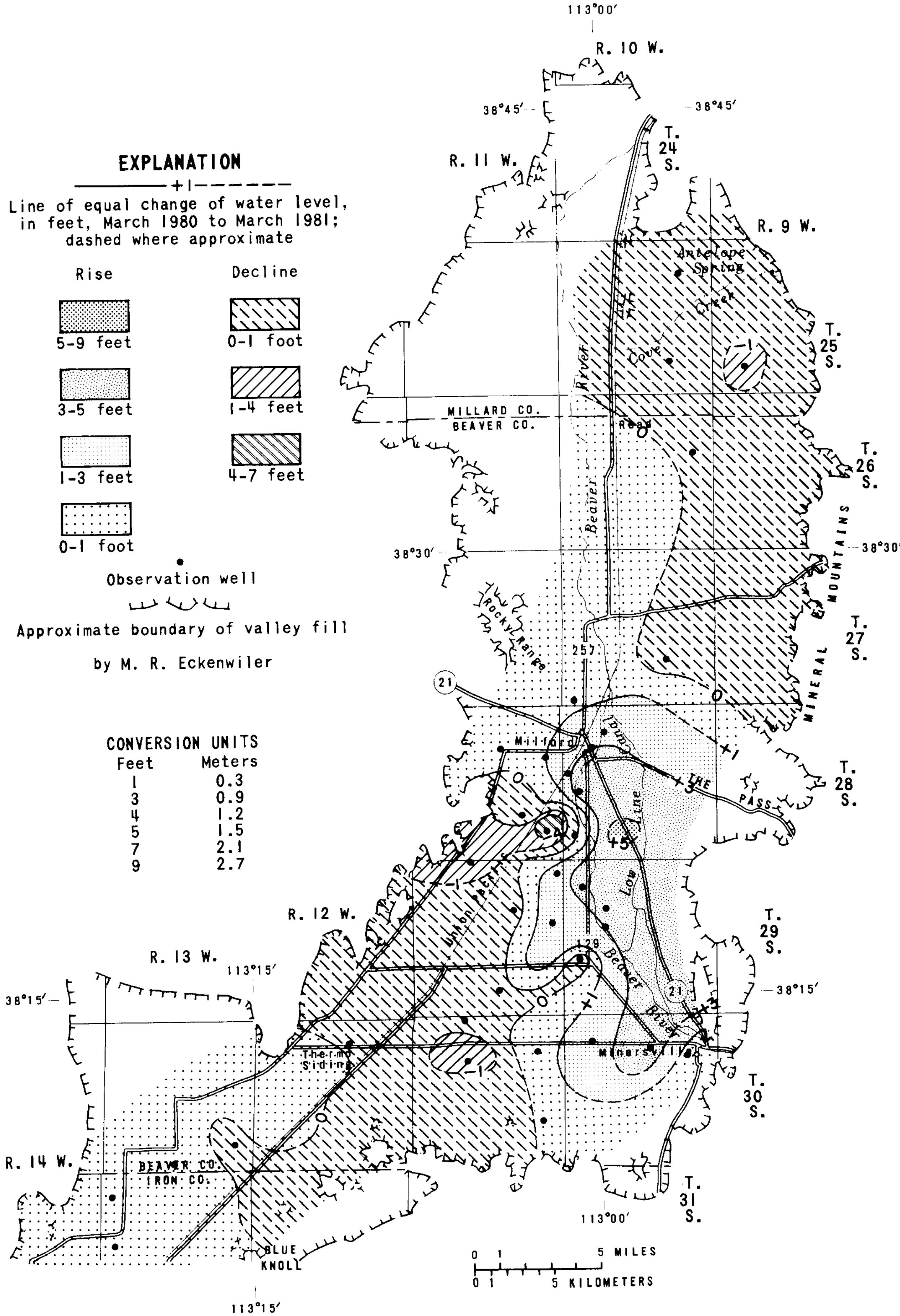

Figure 33.—Map of the Milford area, Escalante Valley, showing change of water levels from March 1980 to March 1981.

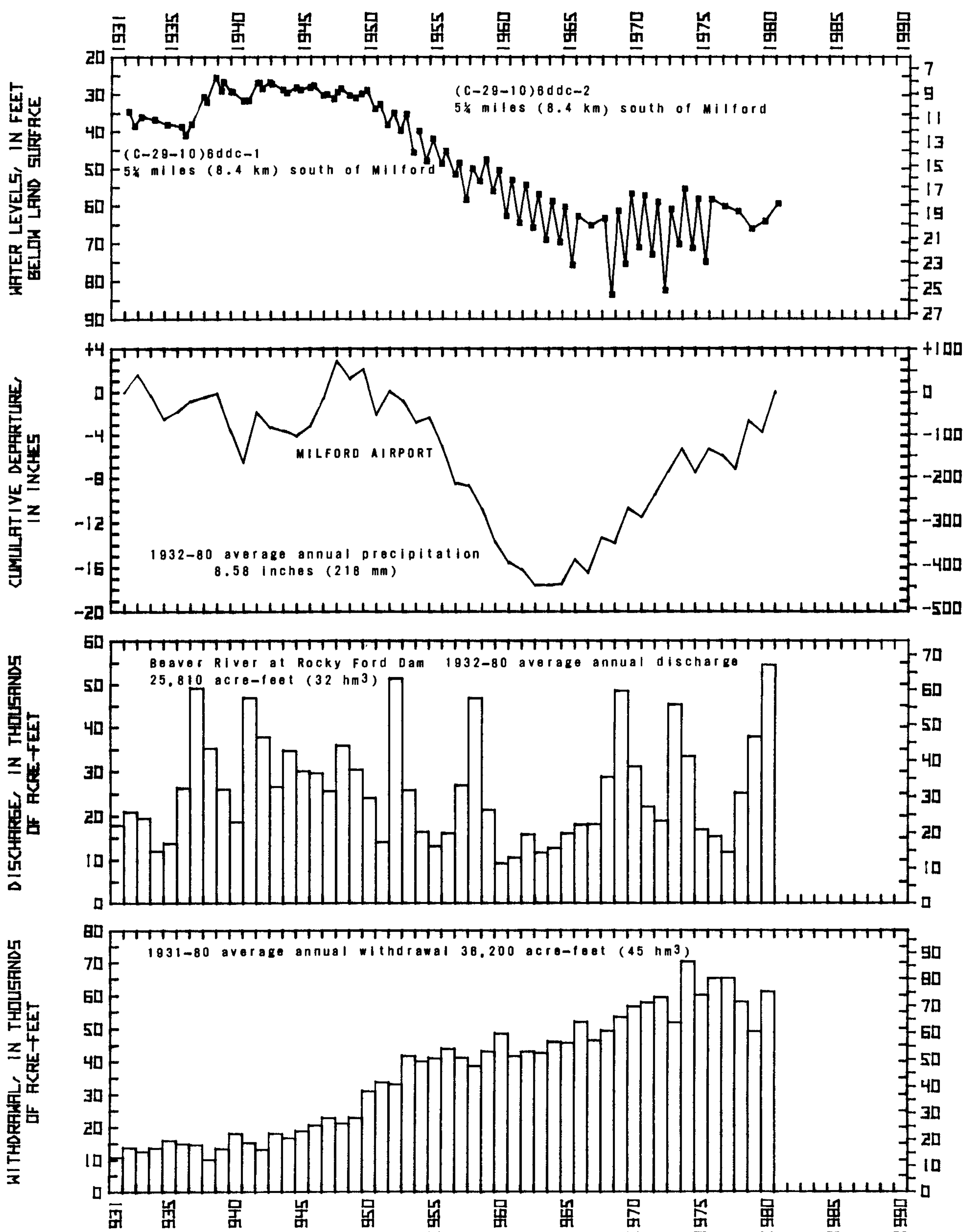

Figure 34.—Relation of water levels in well (C-29-10)6ddc-2 in the Milford area, Escalante Valley, to cumulative departure from the average annual precipitation at Milford Airport, to discharge of the Beaver River at Rocky Ford Dam, and to annual withdrawals from wells.

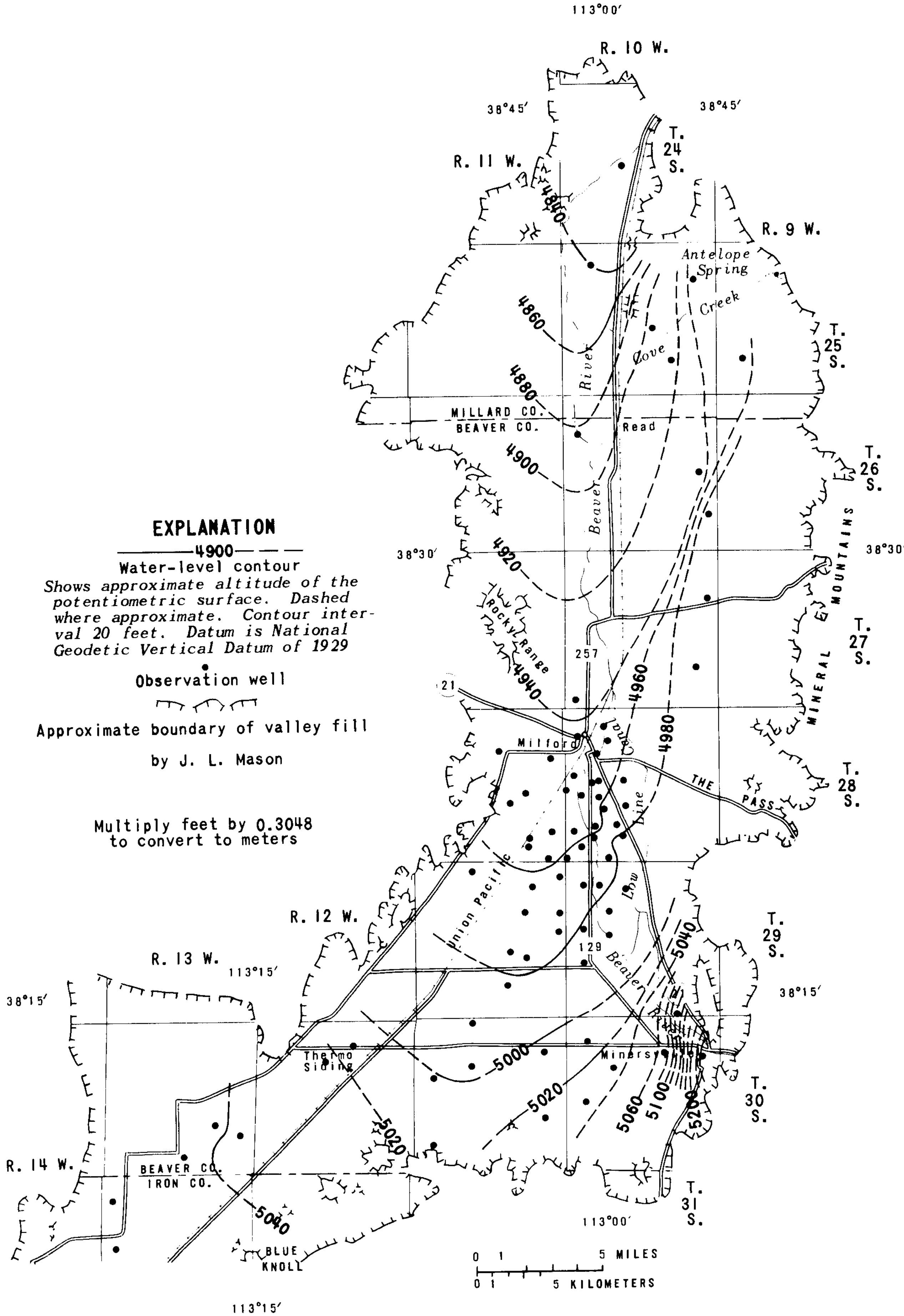

Figure 35.—Map of the Milford area, Escalante Valley, showing the approximate potentiometric surface, March 1981.

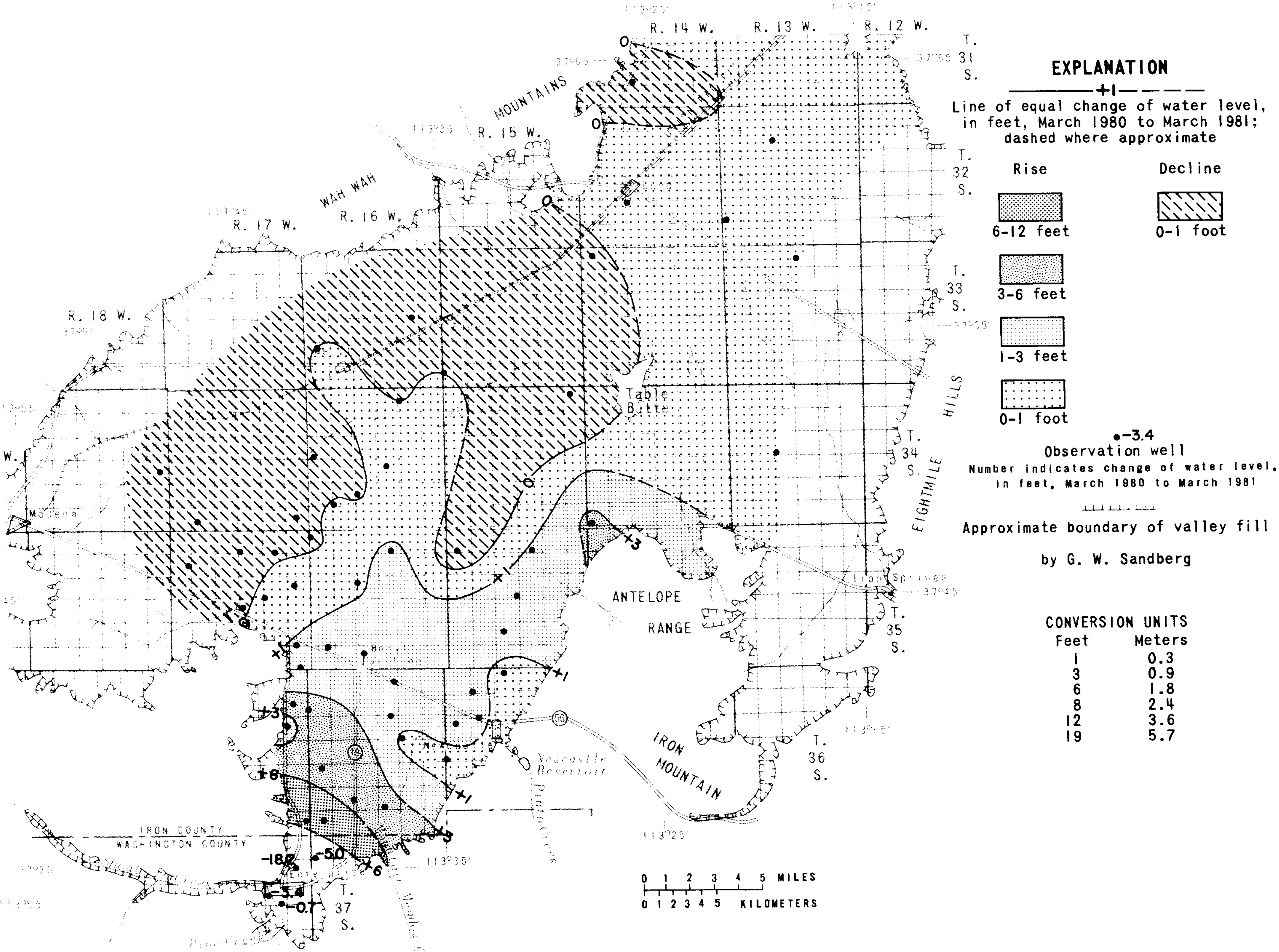

Figure 36.—Map of the Beryl-Enterprise area, Escalante Valley, showing change of water levels from March 1980 to March 1981.

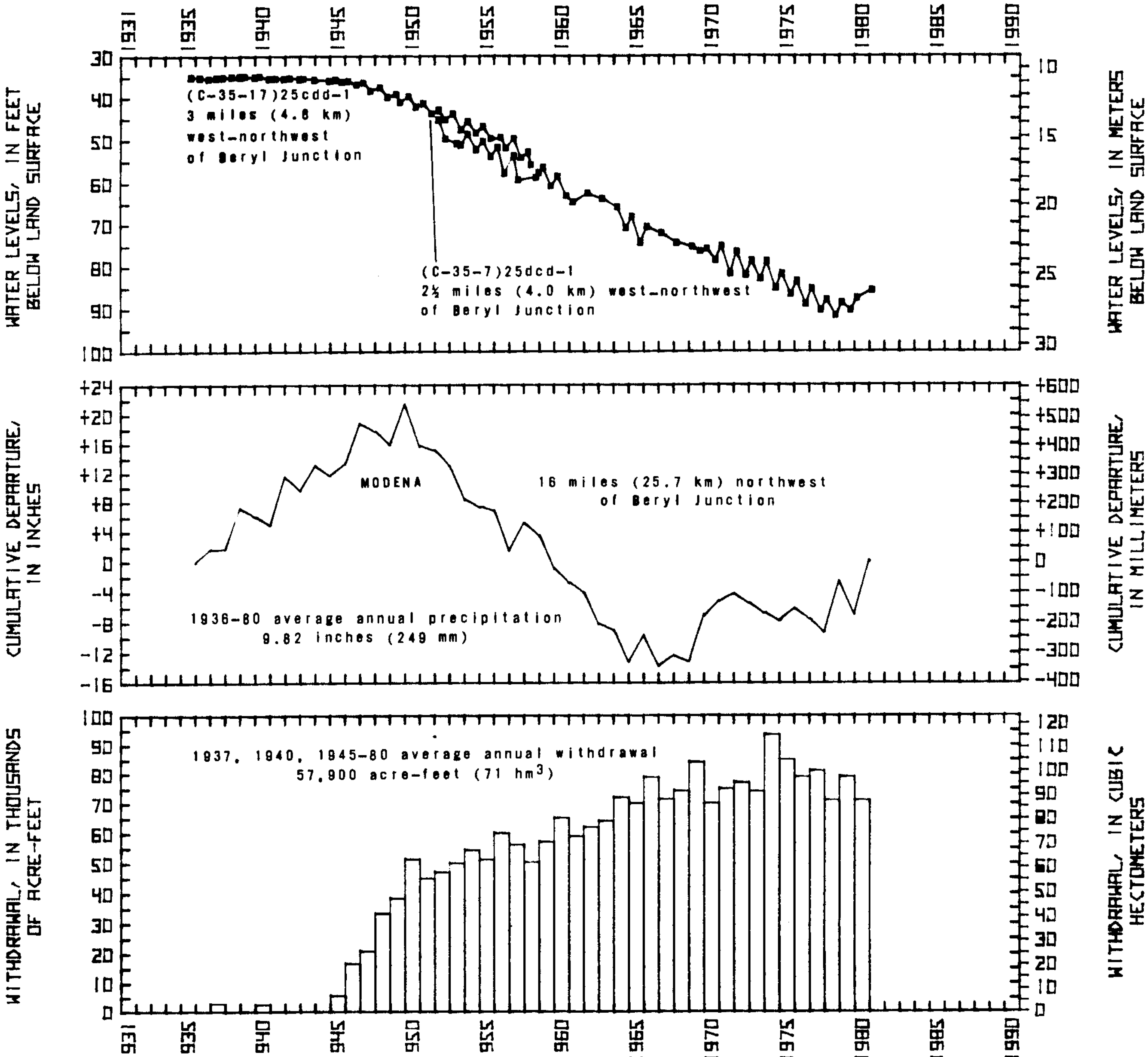

Figure 37.—Relation of water levels in well (C-35-17)25dcd-1 in the Beryl-Enterprise area, Escalante Valley, to cumulative departure from the average annual precipitation at Modena and to annual withdrawals from wells.

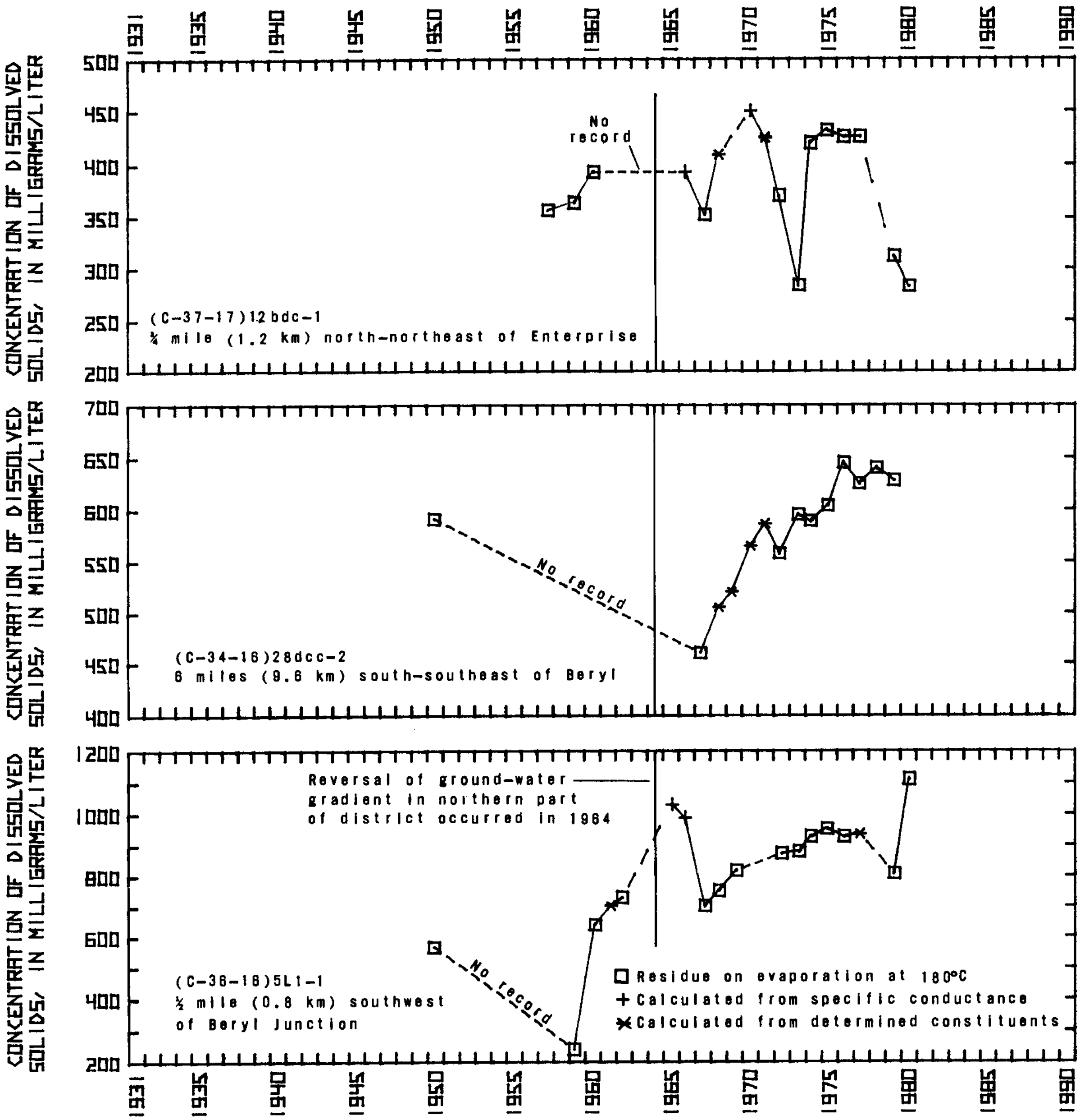

Figure 38.—Concentration of dissolved solids in water from selected wells in the Beryl-Enterprise area, Escalante Valley.

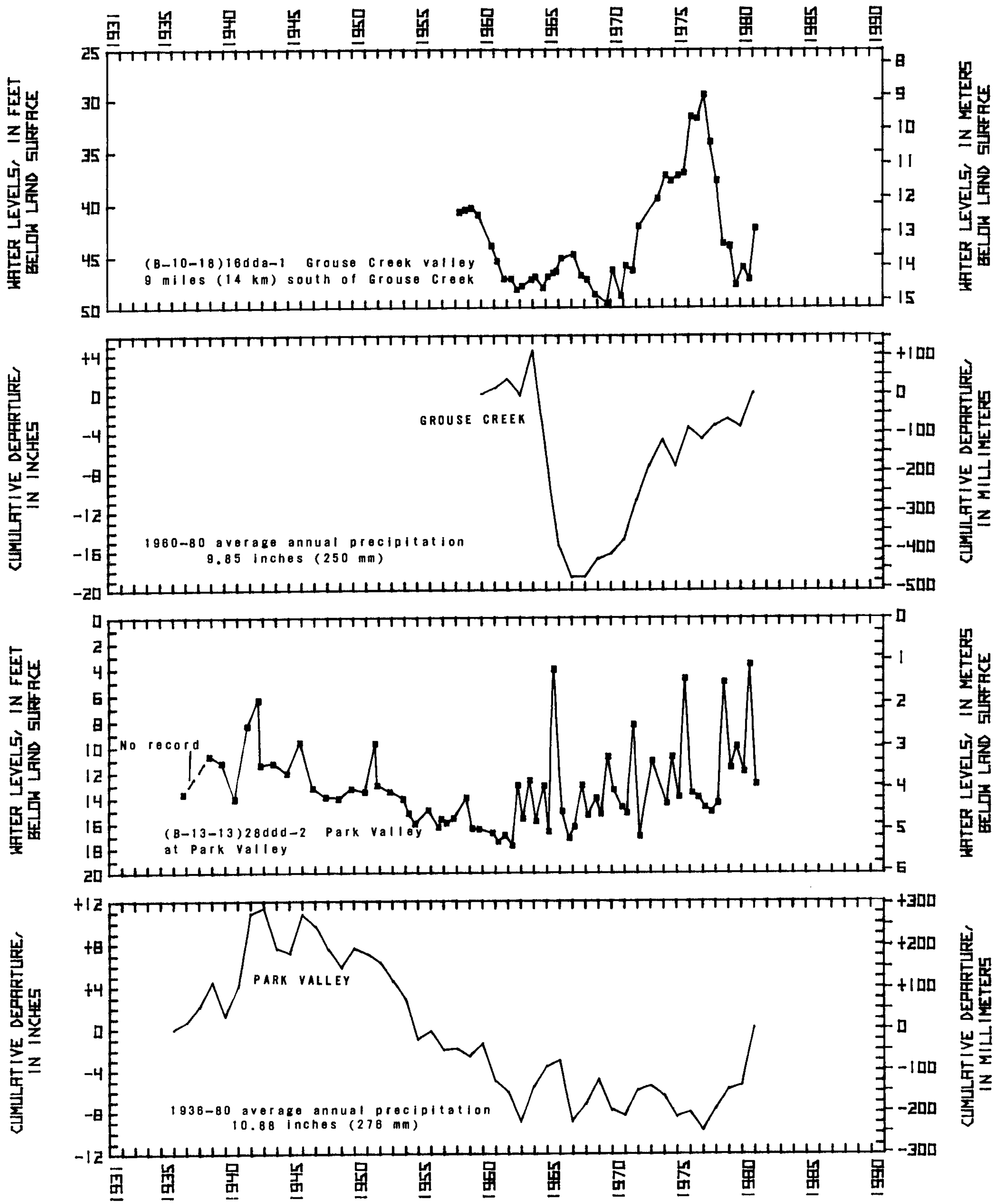

Figure 39.— Relation of water levels in wells in selected areas of Utah to cumulative departure from the average annual precipitation at sites in or near those areas and also total withdrawals from wells in "Other areas."

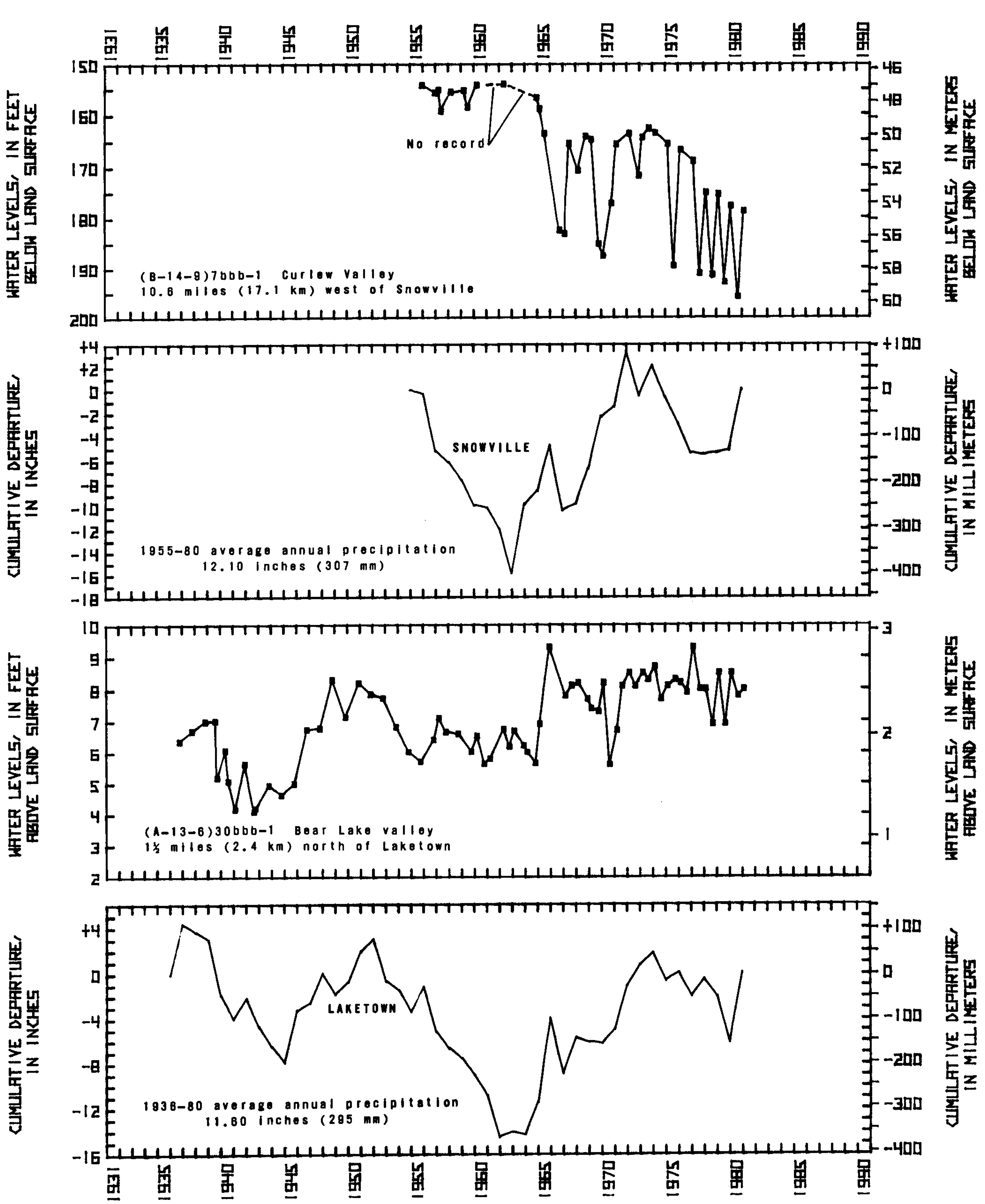

Figure 39.—Continued.

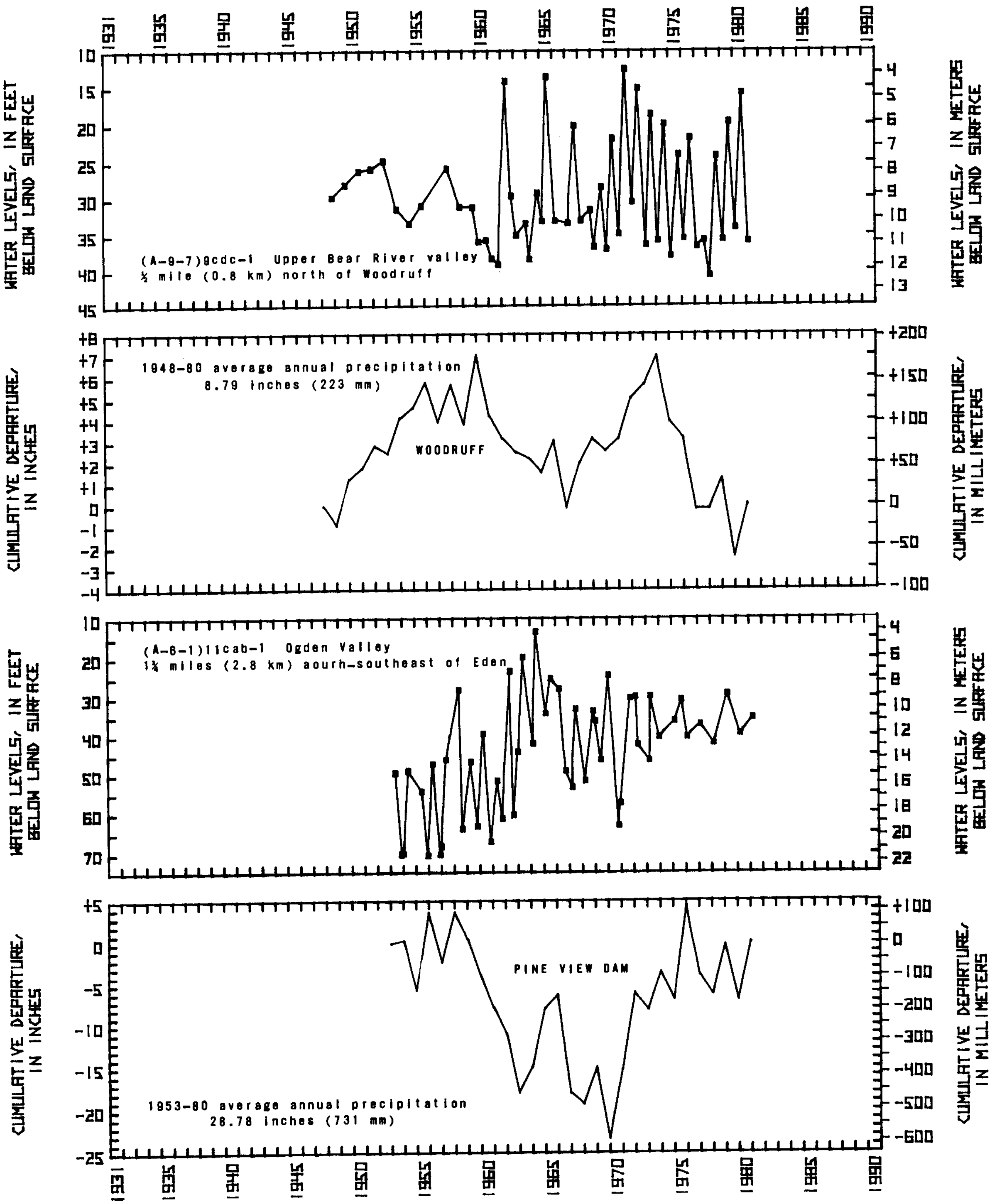

Figure 39.— Continued.

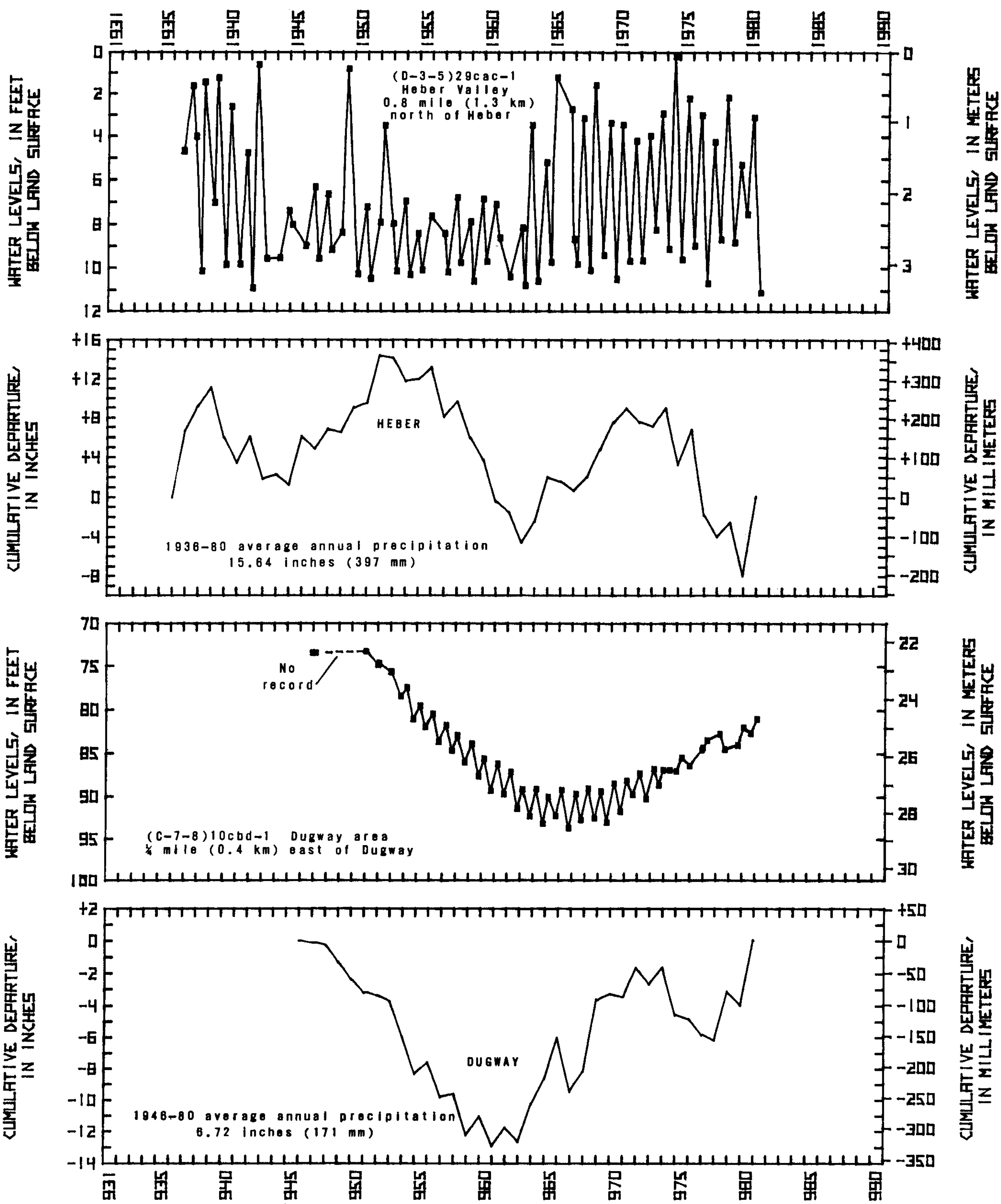

Figure 39.— Continued.

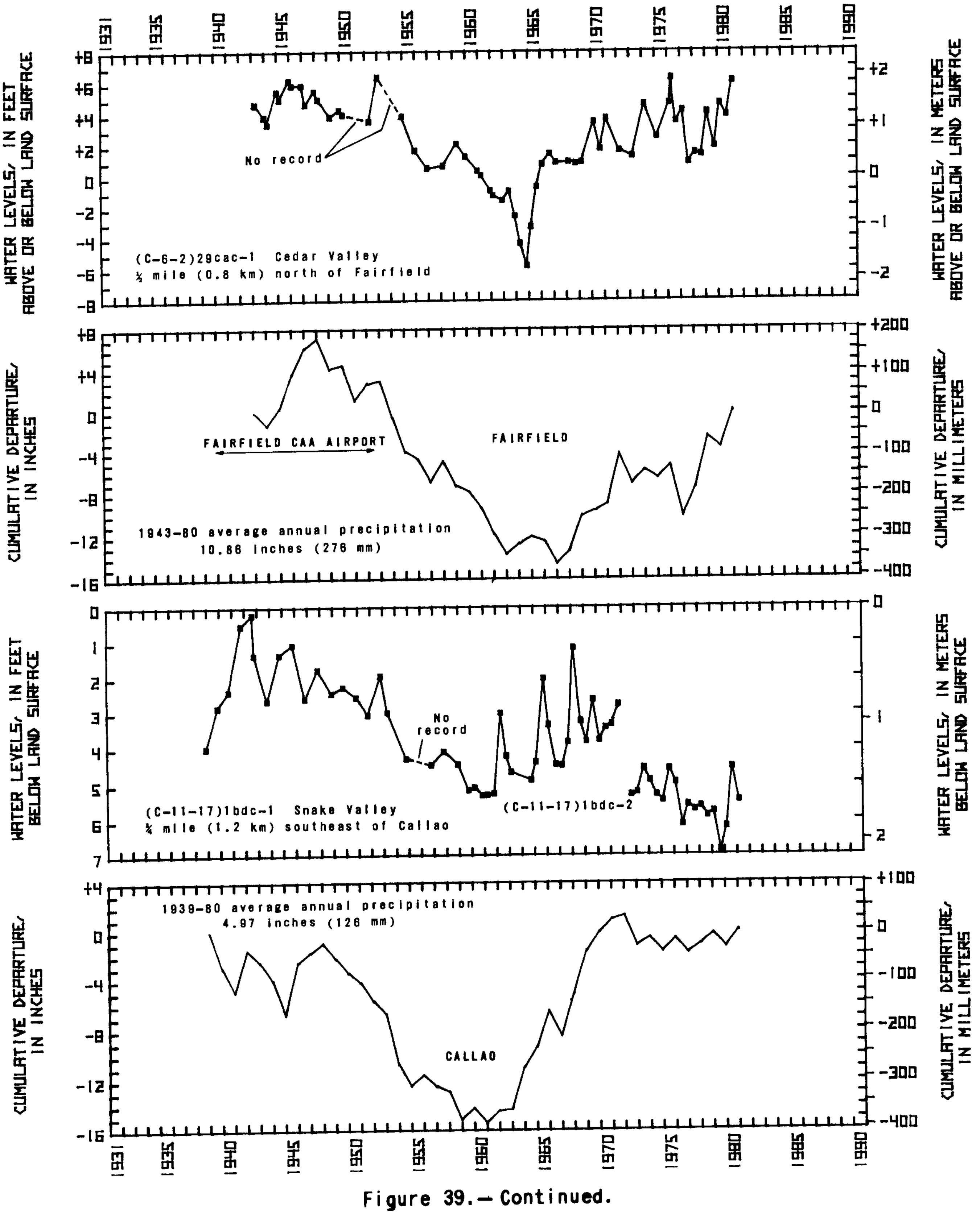

Figure 39.—Continued.

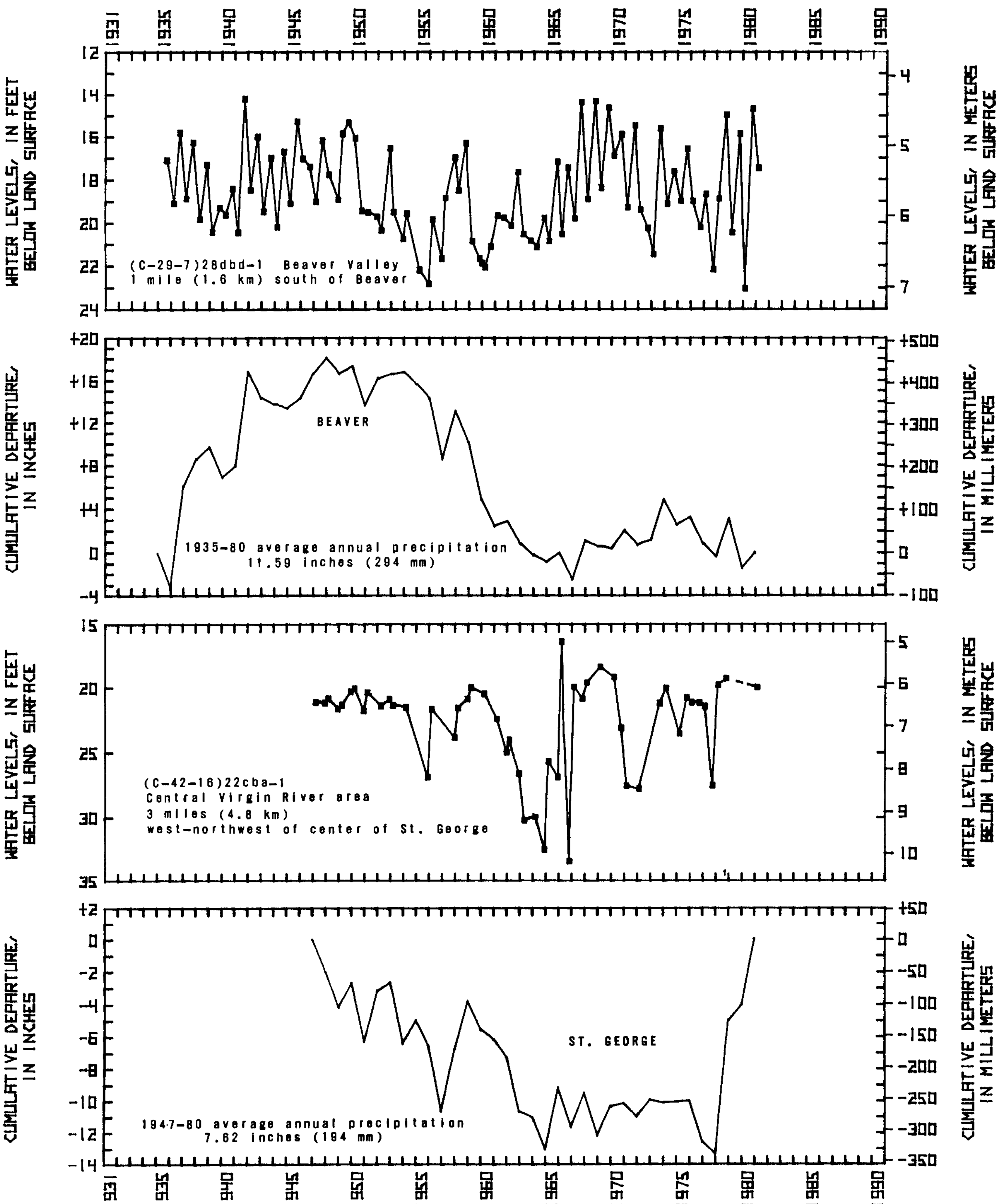

Figure 39.— Continued.

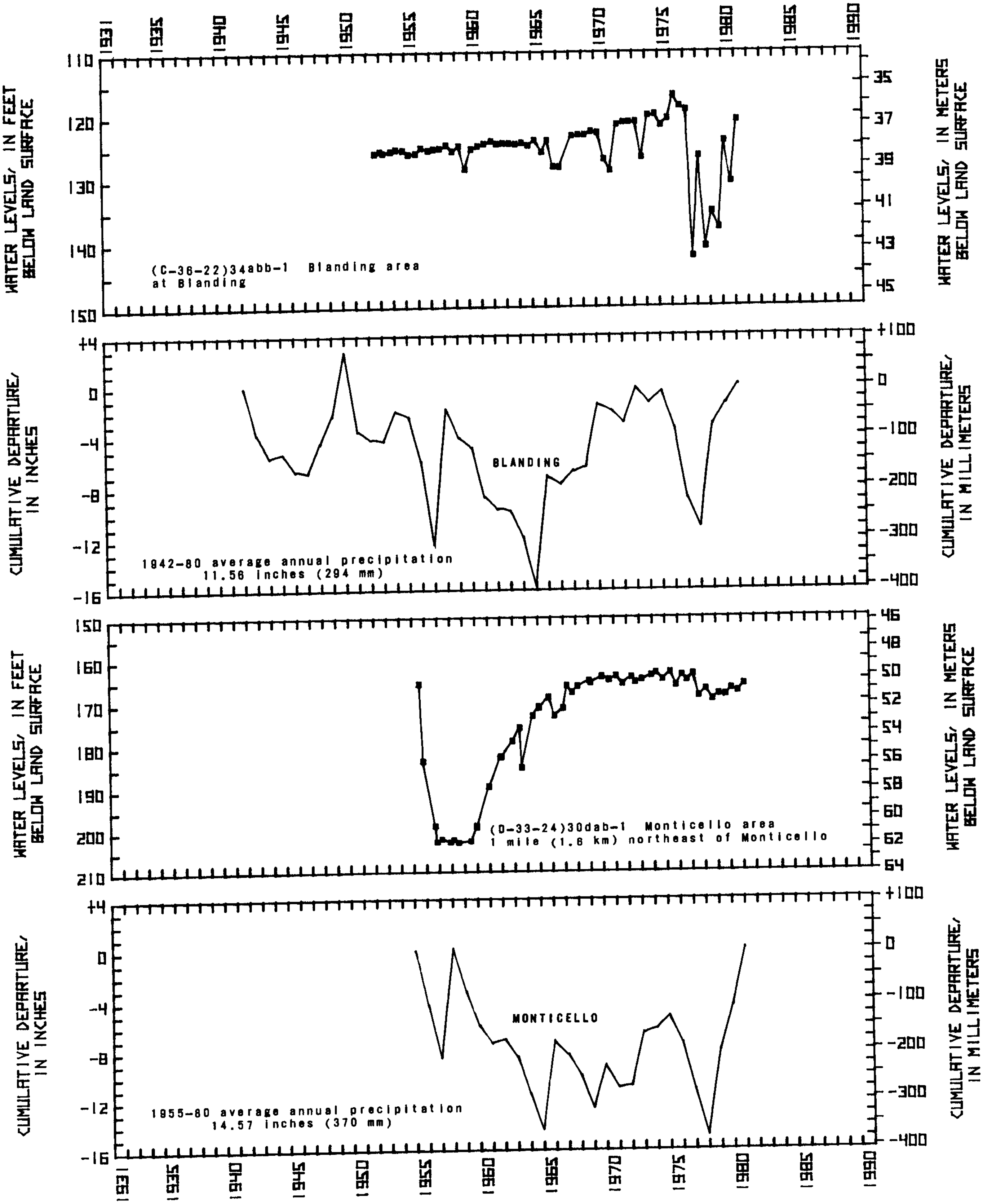

Figure 39.— Continued.

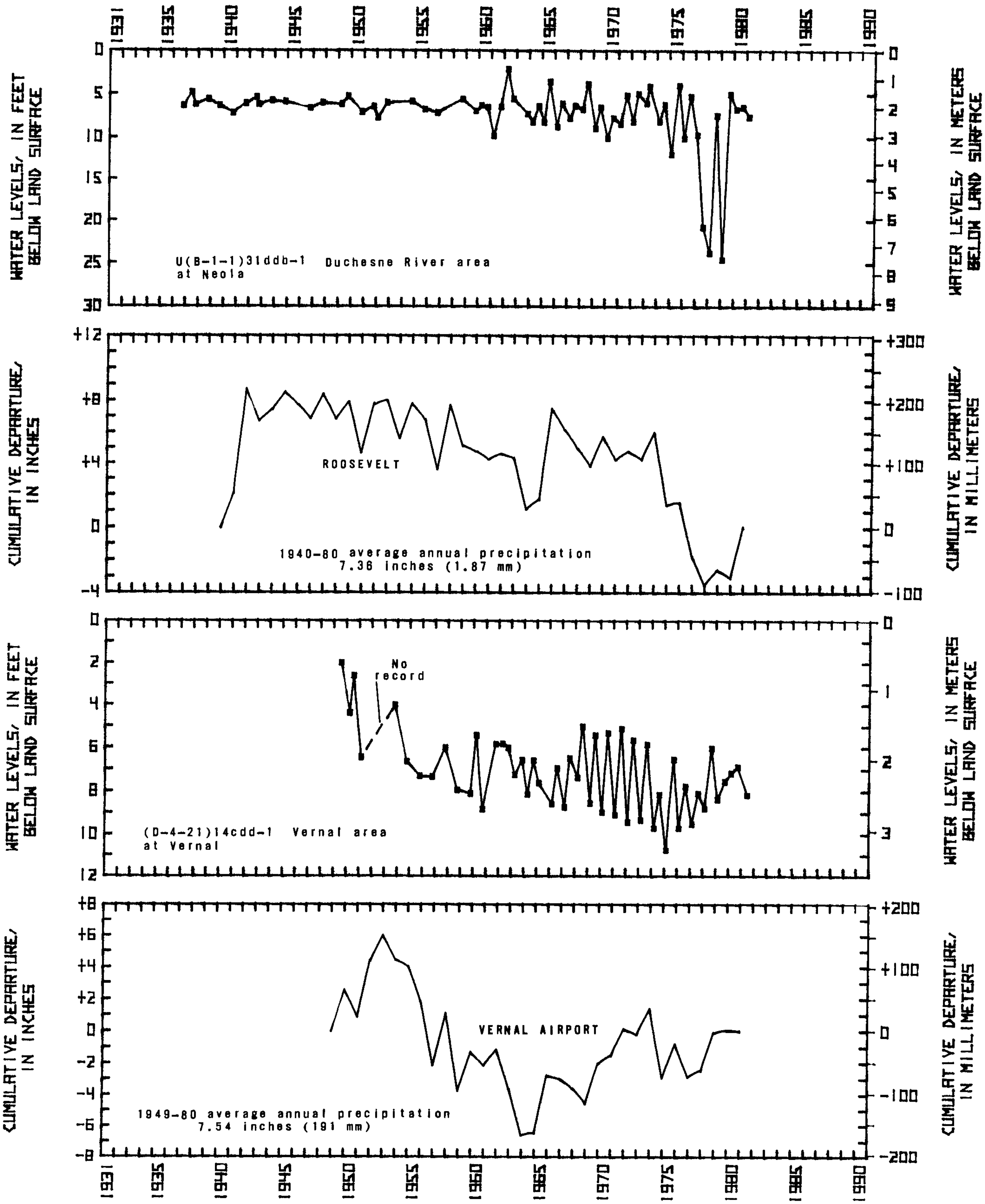

Figure 39.—Continued.

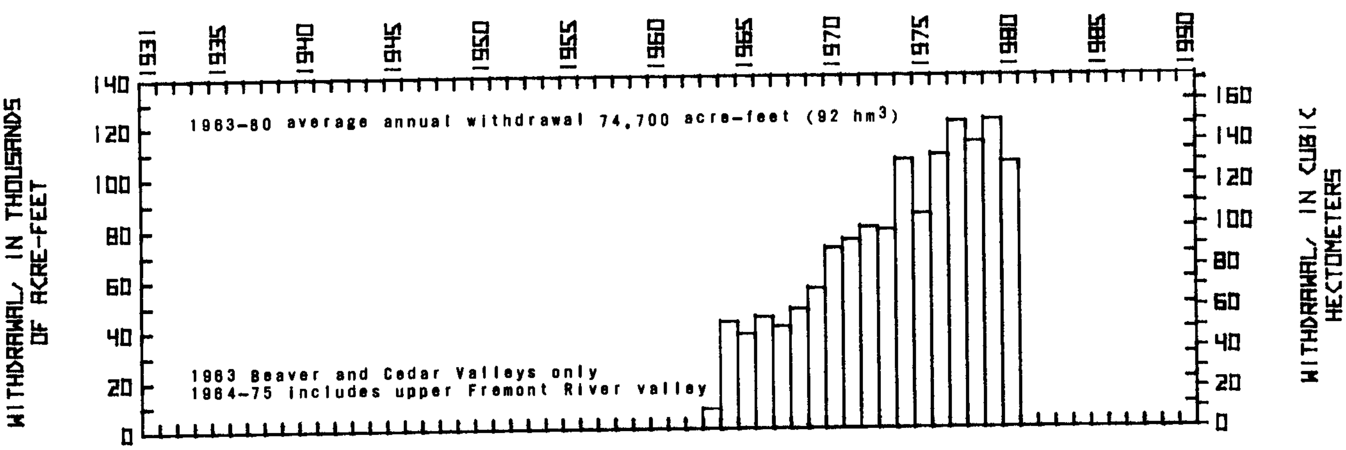

Figure 39.— Continued.

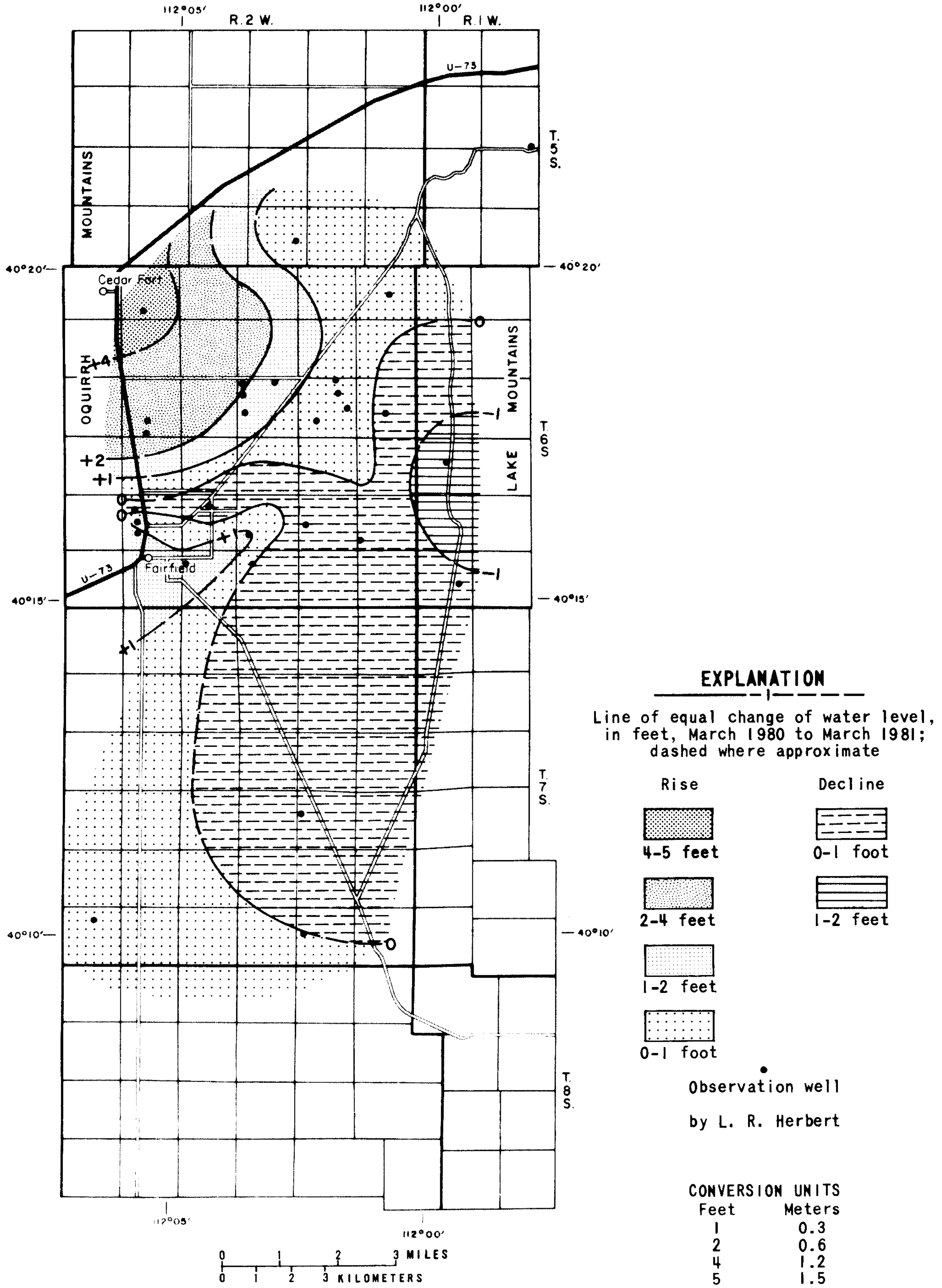

Figure 40.—Map of Cedar Valley showing change of water levels from March 1980 to March 1981.

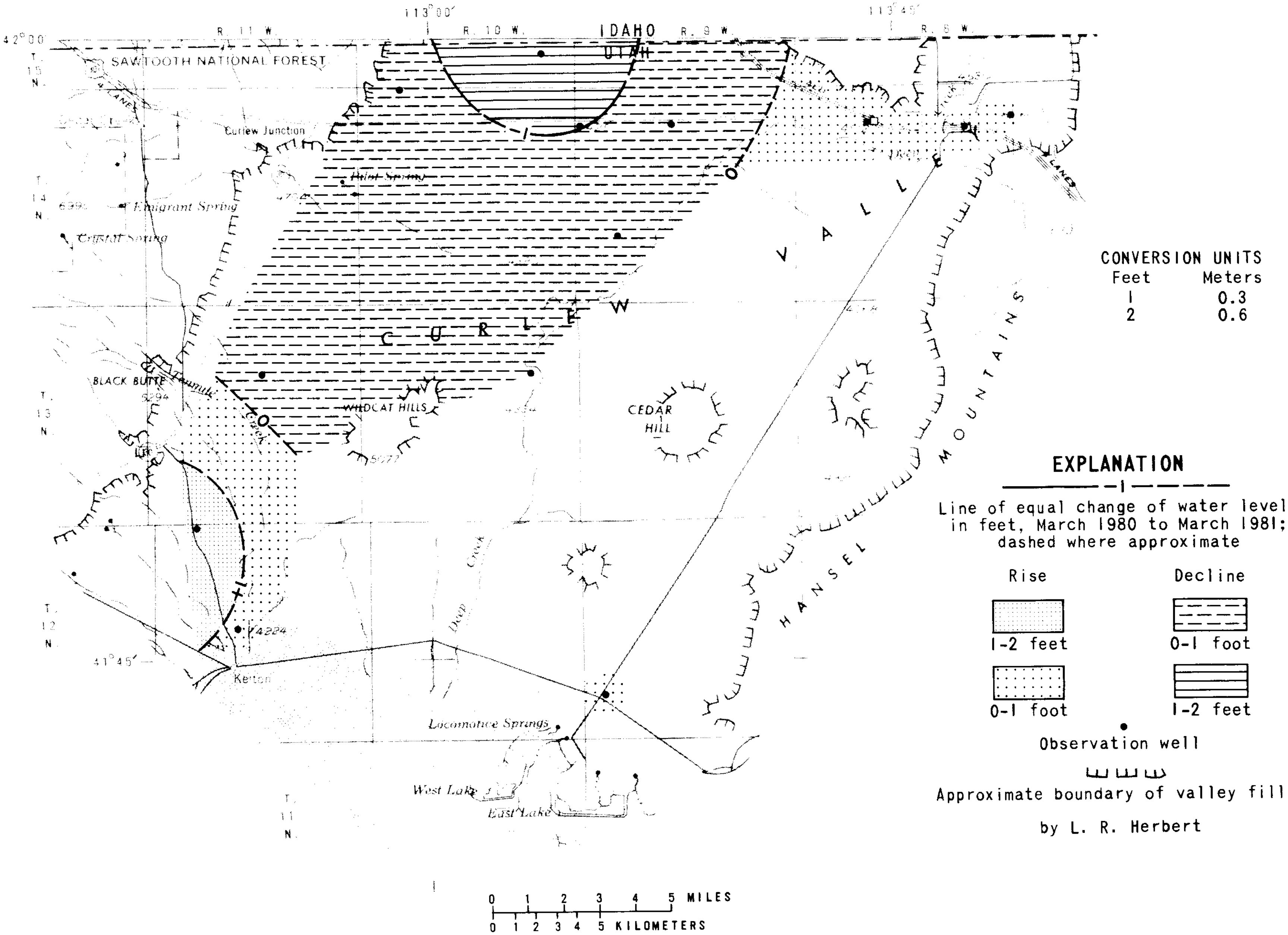

Figure 41.—Map of Curlew Valley showing change of water levels from March 1980 to March 1981.